



Intel-Based Electronic Classroom Implementation Guide

**Intel Electronic Classroom Remote Boot Utility ver2.0/ Qualystem*
LiteNet PC Electronic Classroom Edition v1.15**

May 2001



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Revision History

Date	Revision	Description
April 2001	001	Original document creation

1.0 Document Objective and Usage

This document is intended to help system integrators set up remote boot student computing stations in the Intel-based Electronic Classroom. The Windows* 98 remote boot is made possible by using the following software:

- Intel® Electronic Classroom Remote Boot Utility ver2.0
- Qualystem LiteNET PC* Electronic Classroom Edition v1.15

For optimized performance, it is recommended you follow the set-up implementation and configuration documented in this guide. To avoid network stress, Intel also recommends you disable or uninstall any service that is not needed in the network environment.

The implementation guide will set up the electronic classroom with the following configurations:

- Server
 - Domain controller IPX and TCP/IP protocol
 - Microsoft DHCP server
 - ProxyDHCP and boot server for remote boot
- Student station
 - IPX and TCP/IP protocol
 - Disabled user profiles
 - Windows quick logon mode
 - Disabled network files and printer sharing

The user of this document should be familiar with the following:

- Windows networking
- Adding user groups to Windows NT Server 4.0 and Windows 2000 Server
- Creating network shares in the server
- Setting permissions on shares in the server
- Setting permissions on files in the server
- Installing Windows 98 at student computing stations
- Installing and setting up Microsoft Client for Windows networks at the student computing stations

2.0 Recommended System Requirements

2.1 Server Configuration

2.1.1 Hardware

- Intel® Pentium® III processor at 800 MHz or above
- Intel T440BX or Intel L440GX+ Server Board
- Minimum 20-Gbyte SCSI or IDE hard disk drive
- Intel PRO/100 S Server Adapter

2.1.2 Software

- Microsoft Windows NT 4.0 server with Service Pack 4 or higher
- TCP/IP protocol
- IPX/SPX compatible protocol
- Microsoft DHCP service
- Intel Electronic Classroom Remote Boot Utility ver2.0

2.2 Student Computing Station Configuration

2.2.1 Hardware

- Intel Pentium III processor or Intel Celeron™ processor at 433 MHz or above
- Intel CA810A, CA810E or recommended third-party boards.
Note: Identical motherboards must be used for each student computing station.
— Please contact your local Intel sales office for details.
- PXE2.0 compliant system
- 100 Mbps Ethernet Adapter
- Floppy disk drive
- Hard disk drive and CDROM (for first installation)

2.2.2 Software

- Microsoft Windows 98 First or Second Edition
- TCP/IP protocol
- IPX/SPX compatible protocol
- PXE Boot ROM build 082

3.0 Remote Boot Installation Overview

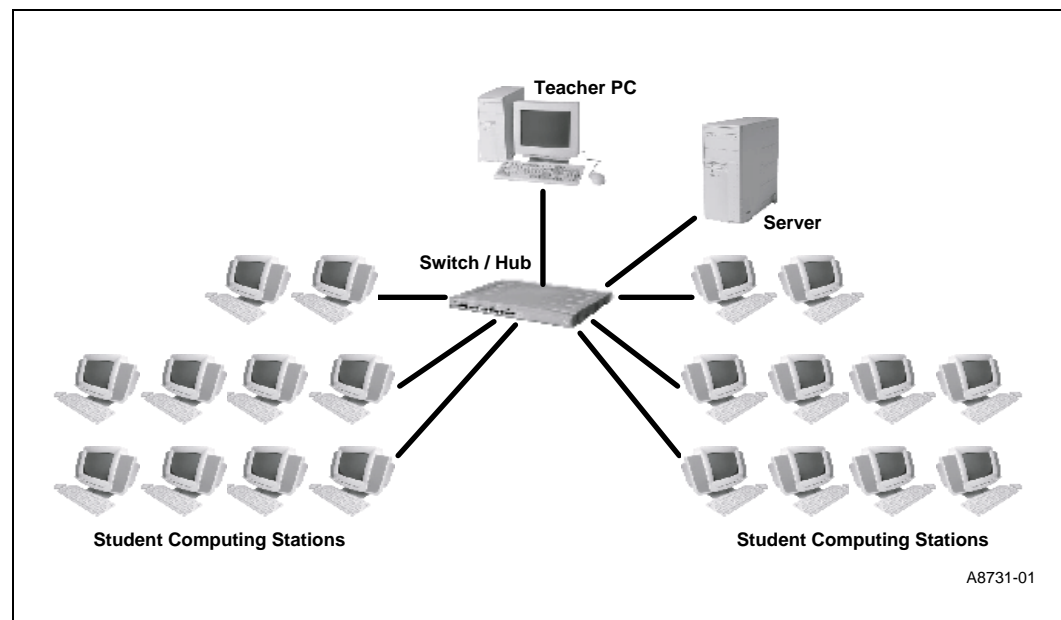
The following software is needed to make the Windows 98 remote boot successful:

1. Intel Electronic Classroom Remote Boot Utility ver2.0
2. Qualystem LiteNET PC Electronic Classroom Edition v1.15

The Qualystem LiteNET PC Electronic Classroom Edition is a solution that allows you to boot student computing stations remotely without a hard disk drive in the Windows 98 environment. The student computing stations are connected to a Windows NT4.0 or Windows 2000 server through a switch and the server serves as data storage for all of the student computing stations.

Qualystem LiteNET PC produces a bootable floppy disk configured for remote boot in Windows 98. The boot disk is then converted to a boot image with the Intel Electronic Classroom Remote Boot Utility. The Intel Electronic Classroom Remote Boot Utility provides the necessary services such as the boot server, TFTP protocols and APIs to download the boot image from the server to student computing stations upon power up. The student computing stations then executes the boot image locally and boots up into the Windows 98 environment.

Figure 1. Typical Intel-Based Electronic Classroom Configuration



The following processes are needed to install the Windows 98 remote boot solution:

- Windows NT 4.0/Windows 2000 Server
 - Installation of an operating system, TCP/IP, IPX/SPX compatible protocols and Microsoft DHCP Service
 - Installation of the Intel Electronic Classroom Remote Boot Utility ver2.0
 - Configuration of DHCP, ProxyDHCP and boot services on the same server
 - A remote boot image
 - Shared directories

- Windows 98 Student Computing Station
 - Installation of an operating system, TCP/IP and IPX/SPX compatible protocol
 - Installation of all application software as required, including multimedia teaching software
 - Installation of Qualystem LiteNET PC Electronic Classroom Edition
 - Removing the hard disk from the student computing station that is used for set up

4.0 Remote Boot Installation — Server Installation

The Intel Electronic Classroom Remote Boot Utility and Qualystem LiteNET PC support the Windows NT 4.0 and Windows 2000 server.

This chapter addresses the necessary configuration at the server to make remote boot successful.

Section 4.1 describes how to install the Microsoft DHCP Server on the Windows NT 4.0 Server. Section 4.2 describes the procedure with Windows 2000.

4.1 Windows NT 4.0 Server Installation and Configuration

4.1.1 Operating System Installation

While you are installing the operating system, make sure the following items are completed for remote boot functions to operate properly:

1. Windows NT 4.0 Server; ensure **NTFS file system** is selected.
Create three partitions (C:\, D:\, E:\) at the server:
 - a. Drive C:\ (2 Gbytes) for Windows NT 4.0 installation and Program Files.
 - b. Drive D:\ for student stations' shared root directory storage.
 - c. Drive E:\ for student stations' user profile directories storage.
2. Set Windows NT 4.0 server as the **Primary Domain Controller**.
3. Install the appropriate drivers, including the Network Interface Card.
4. Install TCP/IP and assign a static IP address to the server, i.e., 92.168.42.1.
5. Install IPX/SPX compatible protocol.
6. Install Service Pack 4.0 or later.

4.1.2 Install and Configure the Microsoft DHCP Server

Windows NT 4.0 server provides the DHCP service. A DHCP server is needed to provide the IP addresses for student computing stations when booted up.

4.1.2.1 Installing Microsoft DHCP Server

1. Insert the **Windows NT 4.0 Server Installation CD** into the CD-ROM drive.

2. Choose **Start>Settings>Control Panel>Network>Services**. The network services dialog appears.
3. Click **Add** and select **Microsoft DHCP Server** from the drop down menu.

Note: The set-up files are typically located at **x:\i386**, where 'x' is the drive letter of the CD-ROM.

4. Restart the system to enable the new settings.

Note: If an IP address was not previously assigned, the **Microsoft TCP/IP Properties** dialog box appears and a fixed IP address must be assigned for each network adapter on the server.

4.1.2.2 Creating A New Scope for the DHCP Server

After installing Microsoft DHCP Server, a scope needs to be created to define an IP address range assigned to a group of student computing stations.

1. Open **DHCP Manager** (Start>Programs>Administrative Tools (Common)>DHCP Manager).
2. Select **Add DHCP Server to Server List** (Server>Add) and enter the server fixed IP address.

Note: You may check your server IP address at Start>Settings>Control Panel>Network>Protocols>TCP/IP Protocol Properties.

3. An IP address will be displayed under **Local Machine**, i.e., 192.168.42.1.
4. Highlight the server IP address and select **Scope>Create** to create a new scope.
5. In the **Start Address** and **End Address** boxes, enter the start and end IP addresses for the available range of addresses defined by this scope.

For example, a scope that contains 49 IP addresses might look like this:

Start Address: 192.168.42.2
End Address: 192.168.42.50

Note: Do not include the server IP address in the address range, or an IP address conflict will result.

6. Enter the **Subnet Mask** for the IP address range. The subnet mask should be the same as the server subnet mask, i.e., 255.255.255.0
7. Leave the **Exclusion Range** field empty because there is no address range to be excluded.
8. To set the **Lease Duration** for the client IP address lease, select the **Limited To** radio button and enter the appropriate values in the **Days(s)**, **Hours(s)**, and **Minutes** text boxes.
9. A pop-up box will appear asking if you want to activate the scope. Click to **Activate** the scope.

The scope does not contain any data. For the DHCP server to recognize the PXE client, an **option 60** must be defined and included in the scope. Option 60 definition and configuration is discussed in Section 4.4, "Define and Assign Option 60" on page 37.

4.1.3 Windows NT 4.0 Server Configuration for LiteNET PC v1.15

After the installations of Windows NT 4.0, and the appropriate protocols and services, the following configuration must be done before the LiteNet PC installation at the student computing stations.

1. Create the user accounts.
 - a. Create a domain user account with administrator rights **LNGUEST** with password **LNGUEST**. The password must be the same as the user ID.

Note: Select **Password never expires** and **User cannot change password**

- b. Create a domain user account for each user in the electronic classroom domain. The password must be the same as the user ID.

Note: Select **Password never expires** and **User cannot change password**

Note: All student station IDs must NOT have administrator rights.

2. Create a share directory.
 - a. Content Root Directory
 - Create a directory at the server to store all the hard disk content at the setup station, i.e., D:\share.
 - Share the directory to the network. In Windows explore, right click on the directory and choose **Sharing>Share this folder>Apply**.
 - b. Individual Student Folders
 - Create a directory to store the student profiles directory at the third partition, i.e., E:\User.
 - Create a directory for each student within the User Directory. The folder name must not exceed eight characters, i.e., E:\User\Stu1
 - Share the directory to the network. This must be done for the proper functionality of remote boot. Share access rights as follows:
 - Full Control to Administrator.
 - Full Control to the owner of the folder, i.e., Stu1
 - Remove other access rights.
3. Repeat steps for all student folders, i.e., Stu1 – Stu 50.

Proceed to Section 4.3, “Installing The Intel Electronic Classroom Remote Boot (ECRB) Utility Ver2.0” on page 34.

4.2 Windows 2000 Server Installation and Configuration

This section provides step-by-step instructions on how to install and configure Windows 2000 server for the Intel-Based Electronic Classroom Environment.

4.2.1 Operating System Installation

1. Follow the instructions from the installation CD.
2. Format the hard disk into the NTFS file system.
Create three partitions (C:\, D:\, E:\) at the server:
 - a. Drive C:\ (2GB) for Windows 2000 installation and Program Files.
 - b. Drive D:\ for student stations' shared root directory storage.
 - c. Drive E:\ for student stations' user profile directories storage.Reboot the system as prompted.
3. Select **Next** at Window 2000 ServerSetup.
4. Select **Next** at Regional Settings.
5. At **Personalize Your Software**, enter your name and organization. Click **Next**.
6. Select the Licensing Mode you want to use and click **Next**.
7. At **Computer Name** and **Administrator Password**, provide a computer name for your server and a password for administrator. Click **Next**.
8. At **Window 2000 Components**, click **Next**.
9. Configure **Date and Time Setting**. Click **Next**.
10. Choose **Typical** at the networking setting section. Click **Next**.
11. At the **Workgroup and Domain** configuration, provide a workgroup name.
Select default option *No, this computer is not on the network or is on the network without domain*. Click **Next** to begin the installation. The system will reboot after installation is completed.

Note: Some installation steps may have slow response.

4.2.2 Configure Windows 2000 Server

4.2.2.1 Configure Active Directory and Install DHCP

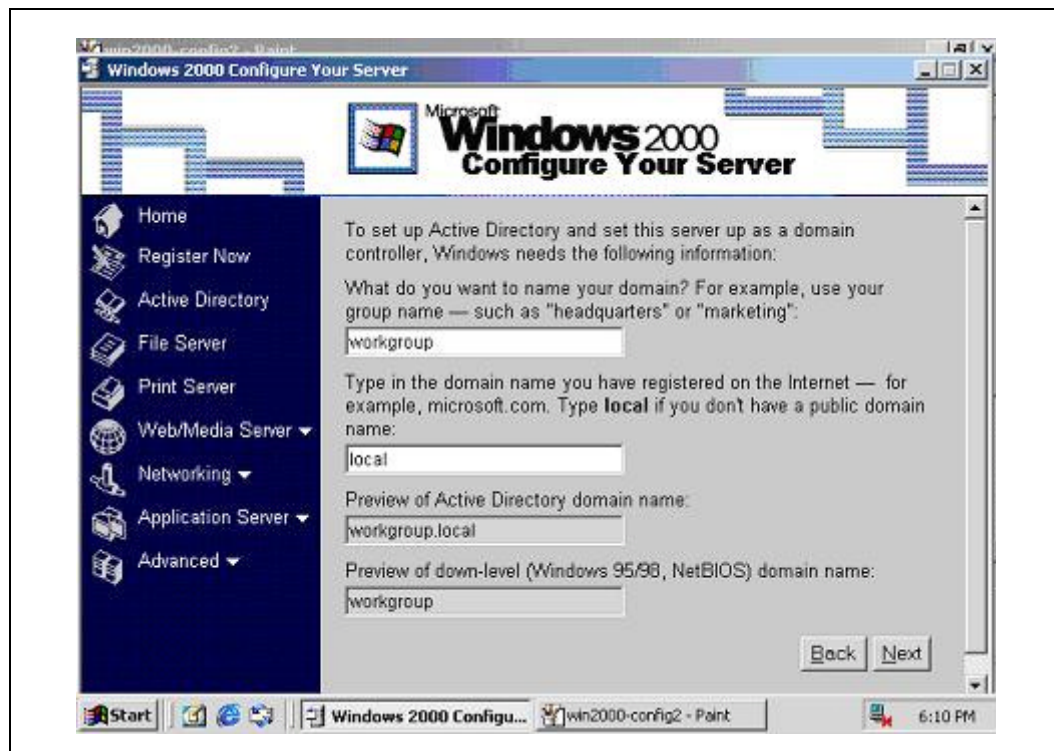
1. At **Windows 2000 Configure Your Server Wizard**, select **This is the only Server on the Network**. Click **Next**.



2. Follow the installation step to configure **Active Directory, DHCP and DNS** on the network. Click **Next**.



3. Provide a **domain name** and **type of domain** as required to set up an Active Directory. Enter **local** if you don't have a public domain name. Click **Next** to continue.



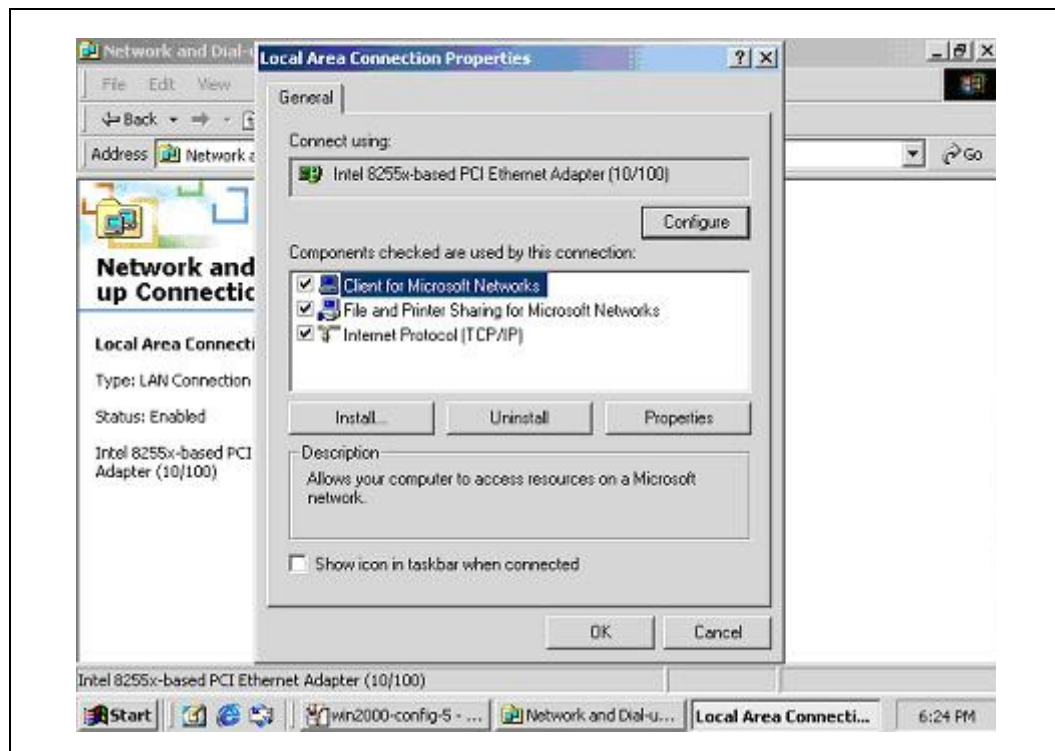
4. Click **Next** again to configure the Active Directory automatically. The server will reboot after the configuration is done.



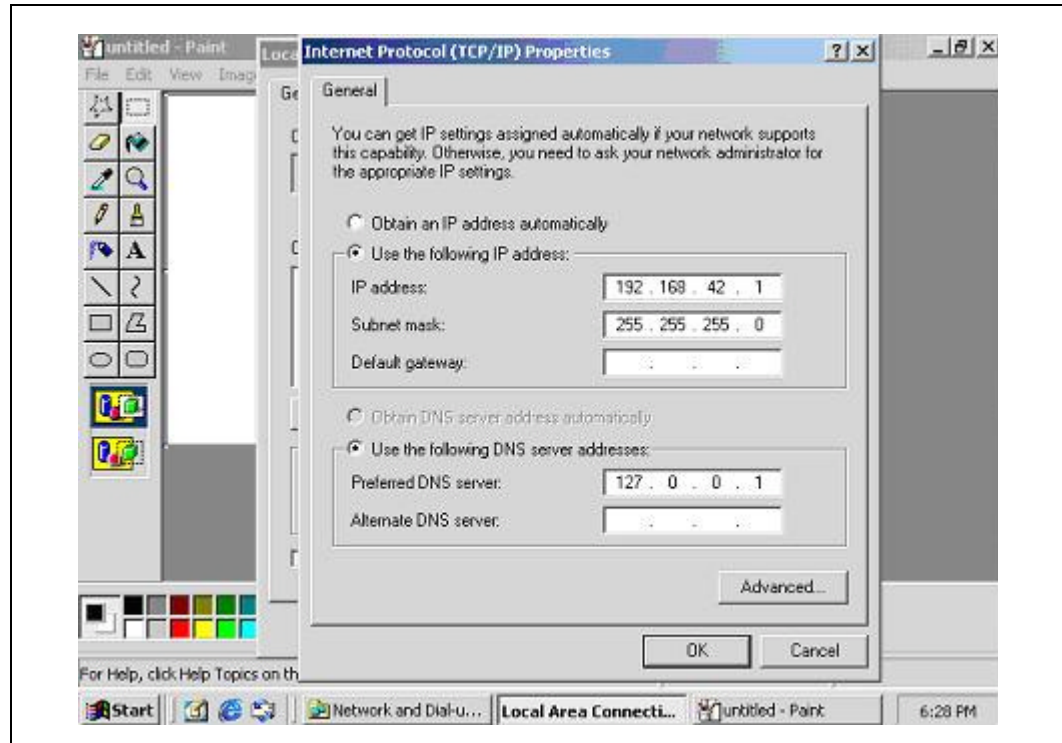
5. Close the **Window 2000 Configure Your Server** wizard.

4.2.2.2 Assign a Static IP Address to the Server

1. Go to **Local Area Connection Properties** (Start>Setting>Control Panel>Network and Dial-up Connection. Right click on **Local Area Connection** and choose **Properties**).



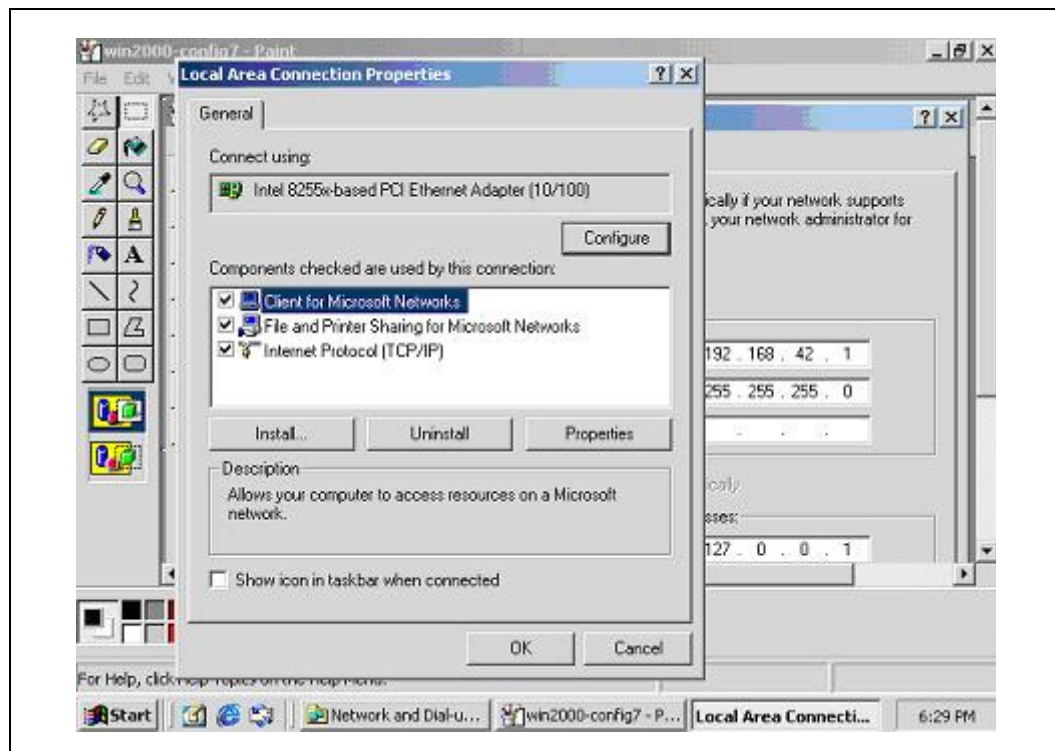
2. Double click the **Internet Protocol (TCP/IP)** to see its properties.
3. Select **Use The Following IP Address** and provide a valid IP address on the network for the server, i.e., 192.168.42.1
4. Provide a **Subnet mask** for the server, i.e., 255.255.255.0
5. Select **Use the following DNS server addresses**.



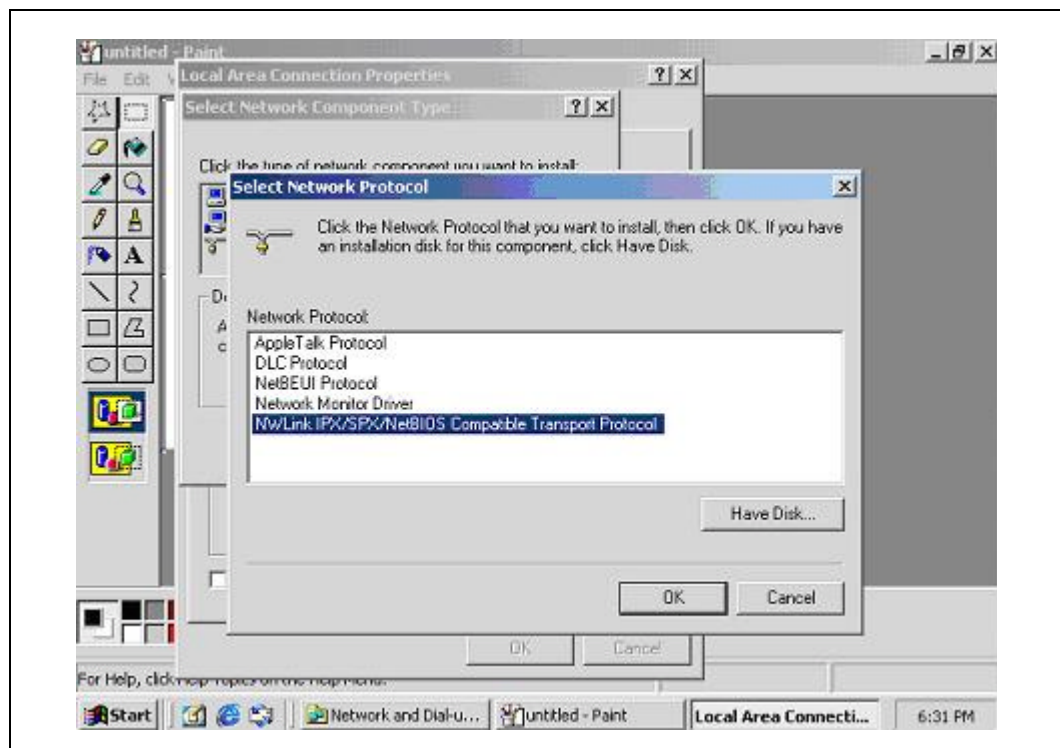
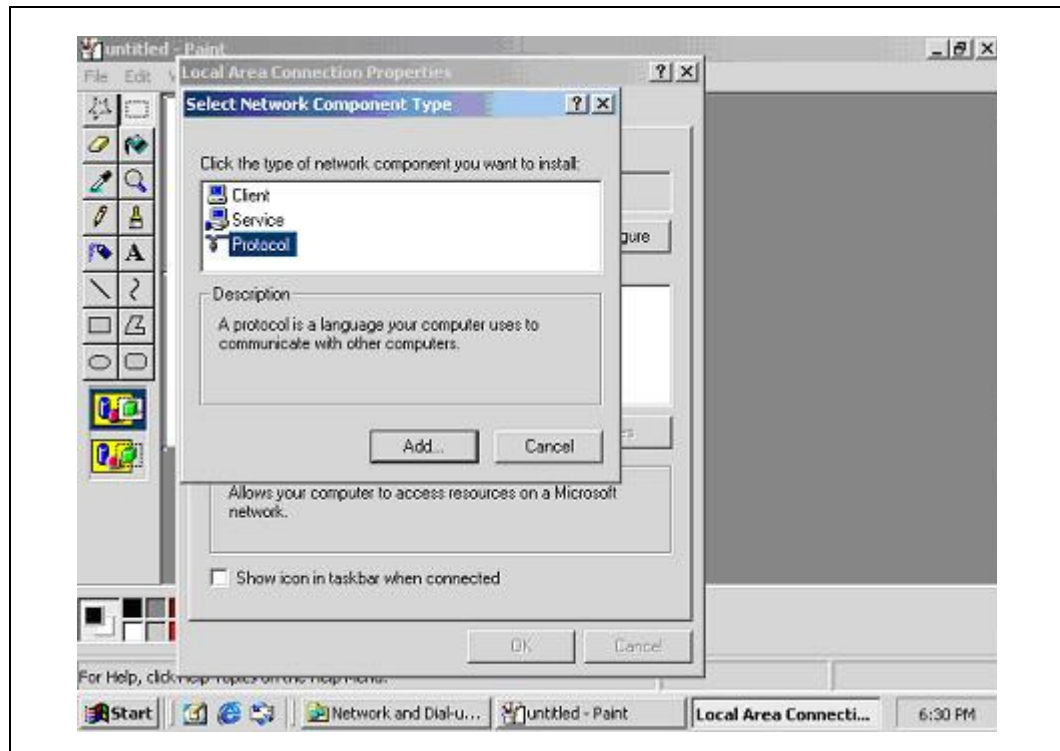
6. Click **OK** to complete the setting.

4.2.2.3 Add IPX Protocols to the Server

1. Go to **Local Area Connection Properties** (Start>Setting>Control Panel>Network and Dial-up Connection. Right Click on **Local Area Connection** and choose **Properties**).

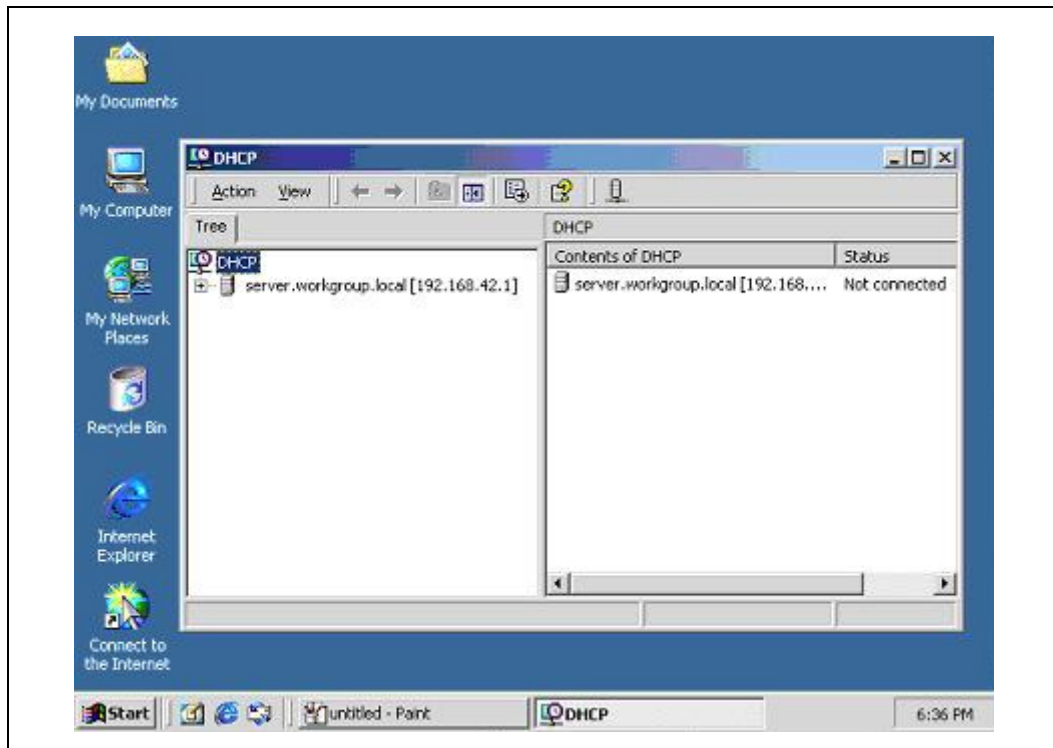


2. Install **IPX protocol** (Install>Protocol> Add>NWLink IPX/SPX/NetBIOS Compatible Transport Protocol). Click **OK**.

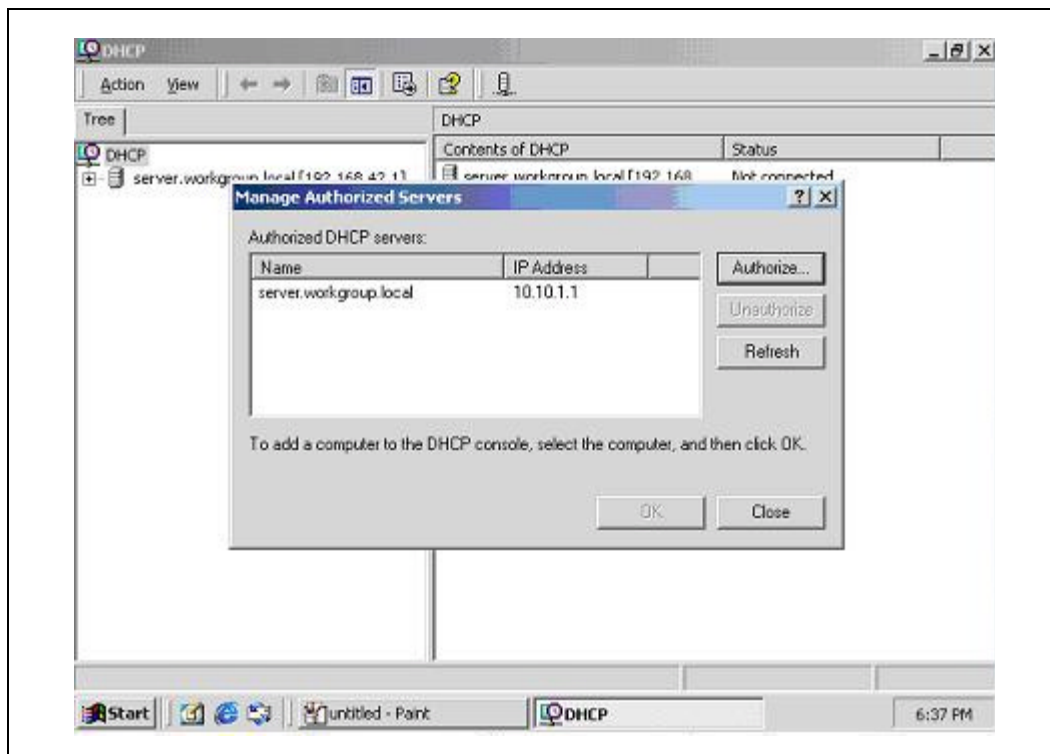


4.2.2.4 Authorizing the DHCP Server

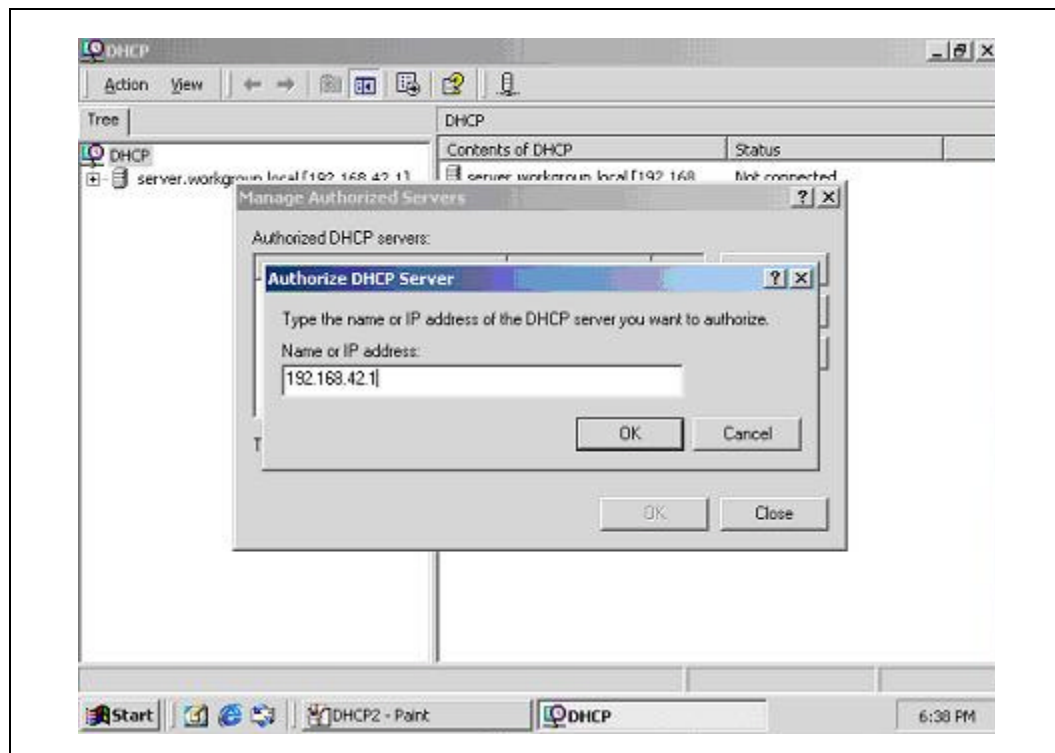
1. Go to **DHCP** (Start>Programs>Administrative Tools>DHCP).



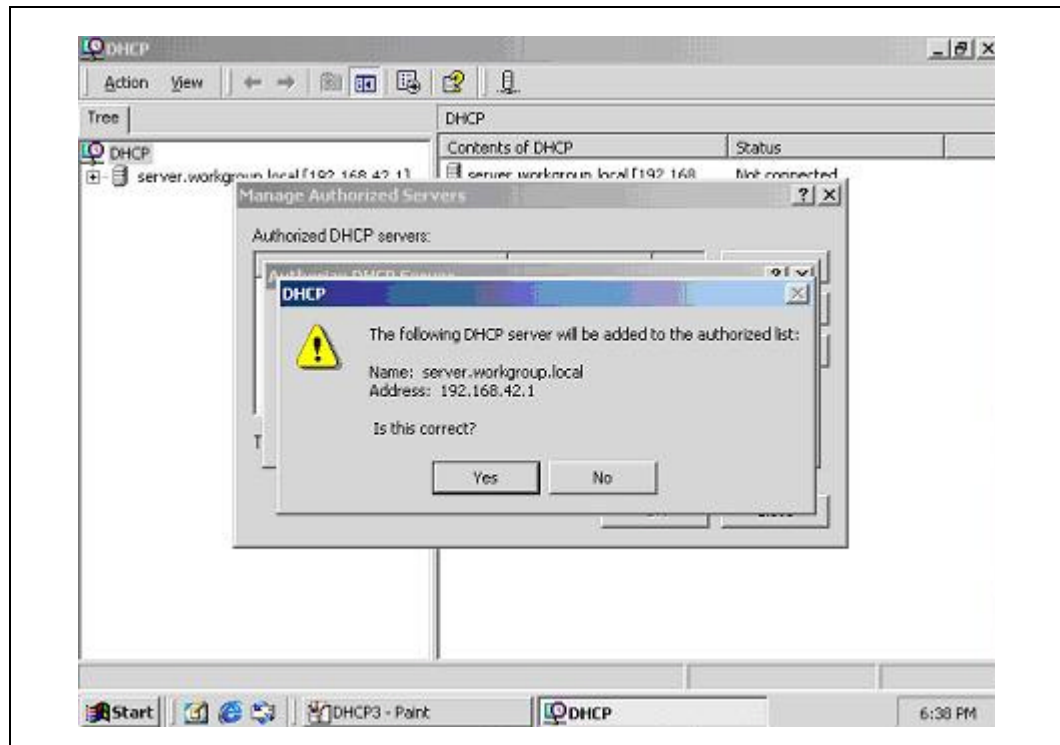
2. Right click on **DHCP** and select **Manage Authorized Servers**.



3. Click on **Authorize** and enter the server IP address to the **Name or IP address** field. Click **OK**.



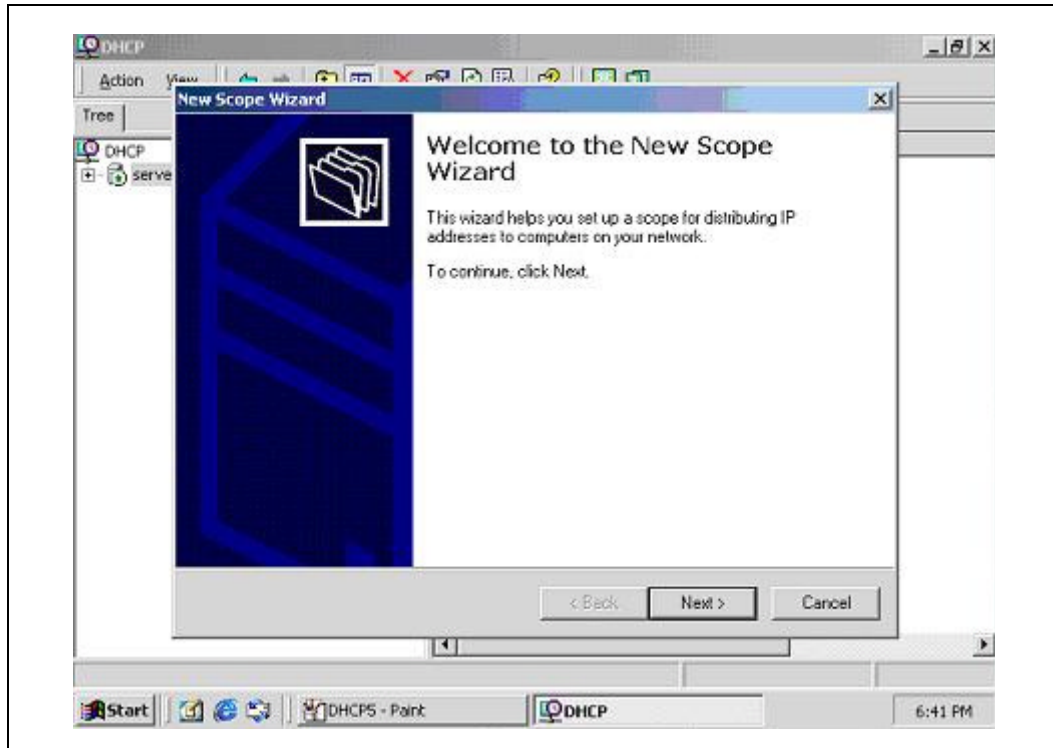
4. Confirm the server to be authorized by clicking **Yes**.



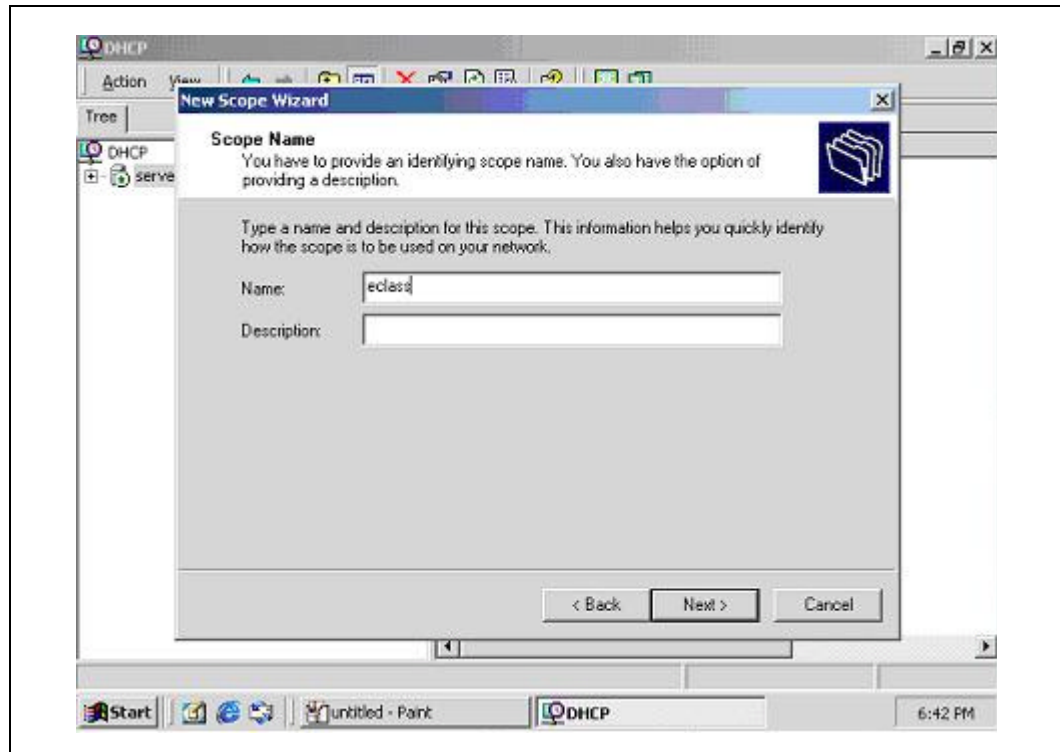
The DHCP Server is now authorized to assign IP addresses to clients.

4.2.2.5 Creating a New Scope for DHCP

1. Go to **DHCP** (Start>Programs>Administrative Tools>DHCP).
2. Double click on the server.
3. Under the **Action** Menu, select **New Scope** to open the **New Scope Wizard**.



4. Provide a name (i.e., eclass) to the scope to be created. (A name must be entered in order to proceed to the next step.) You can also include a description for the scope (optional). Click **Next**.



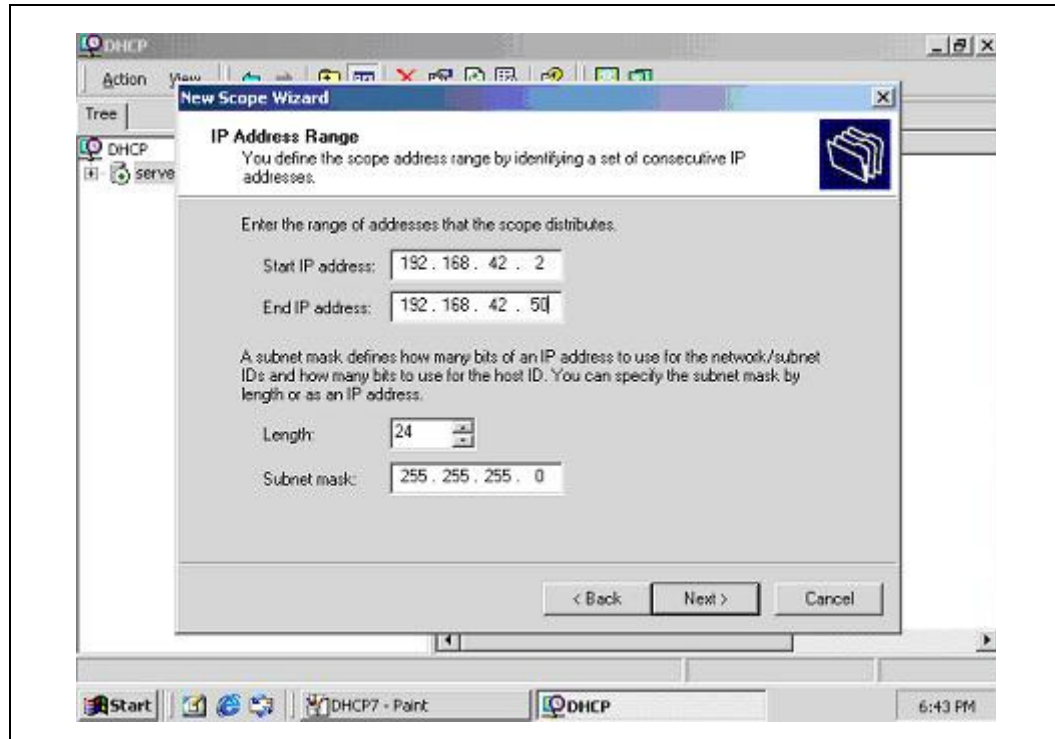
5. Define a valid IP address range:

Example: For 49 addresses range,

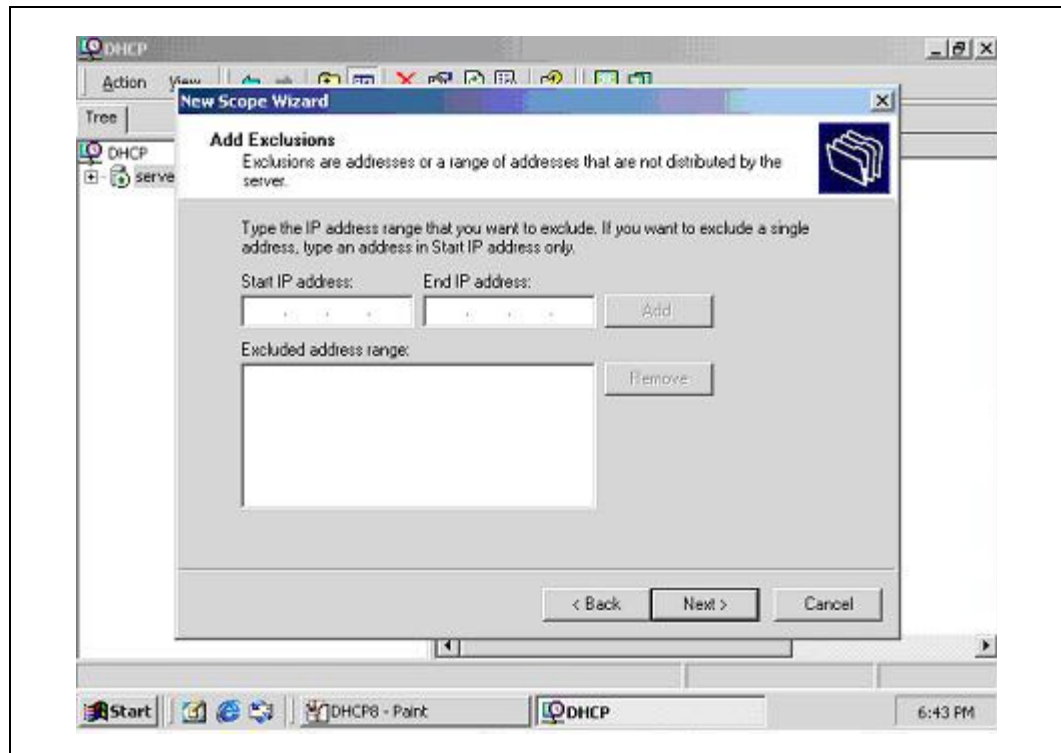
Start IP address: 192.168.42.2

End IP address: 192.168.42.50

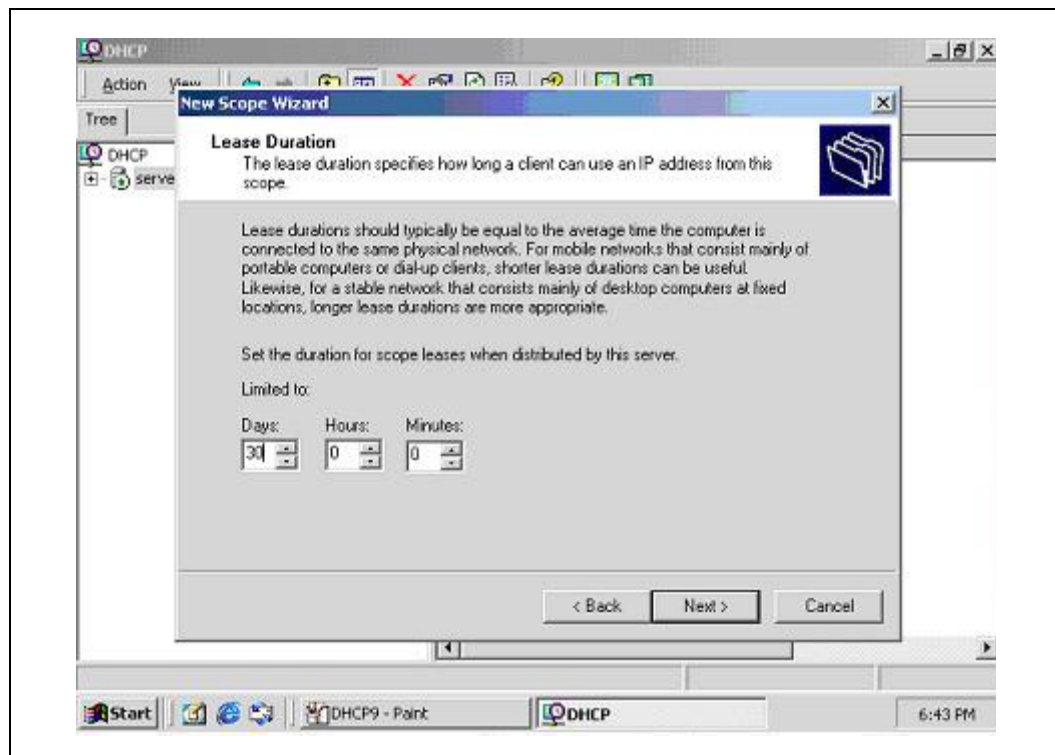
Note: The server IP address must not be in the range, or an IP conflict will result.



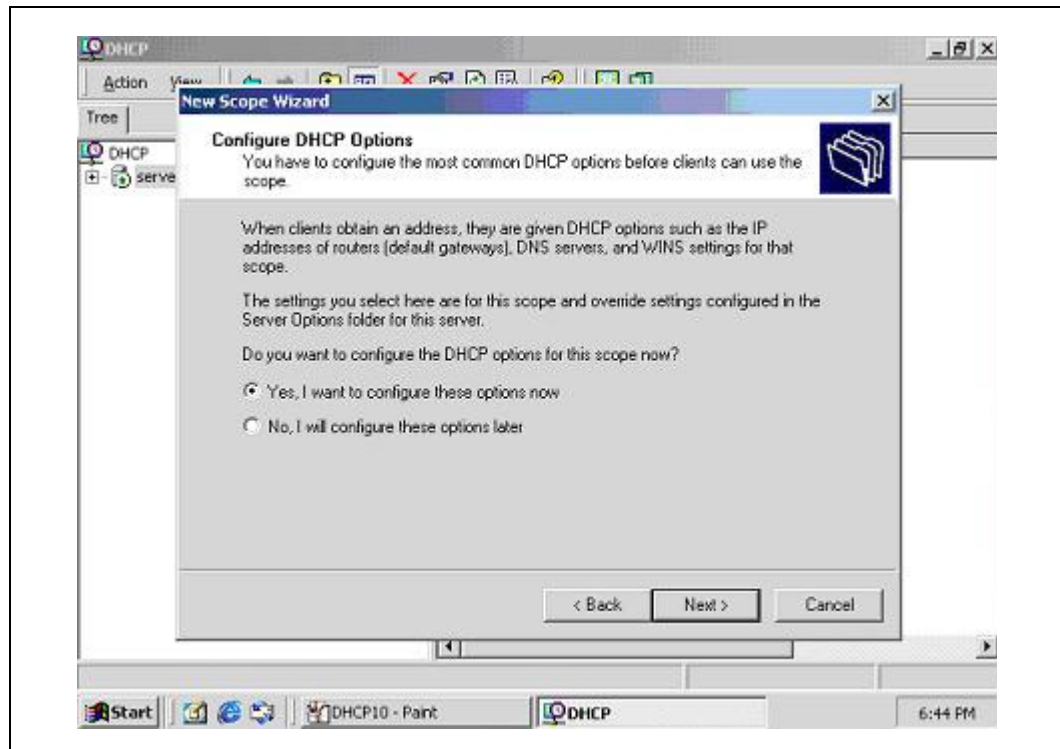
6. At the **Add Exclusions** page, continue by clicking **Next** since there is no IP address range to be excluded.



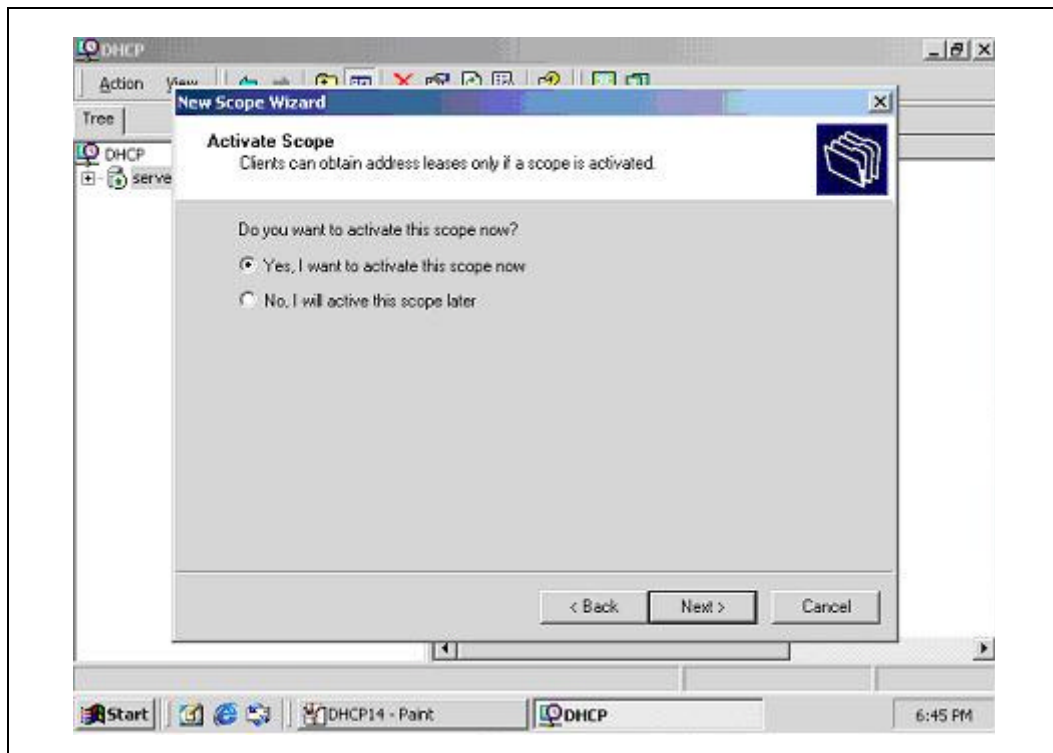
- At the **Lease Duration** page, select a lease duration for the student computing station IP address, i.e.; 30 days. Click **Next** to continue.



8. On the **Configure DHCP Options** page, select **Yes** to configure the options. Click **Next** to continue.



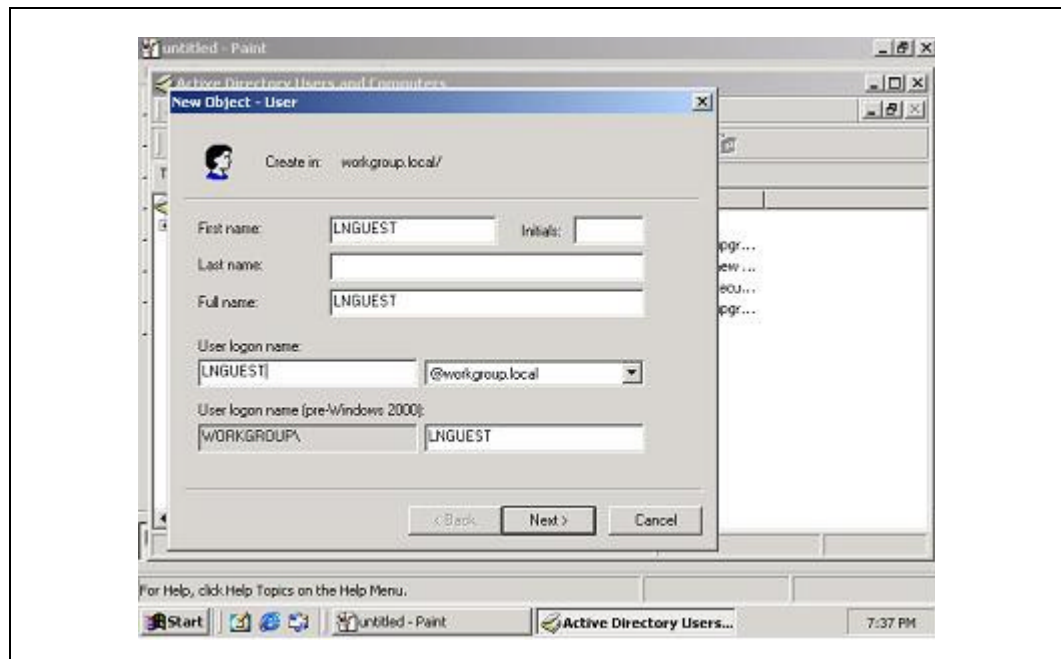
9. Skip **Router, Domain Name and DNS Servers**, and **WINS Servers**, by clicking **Next**.
10. Activate the scope and click **Next** to complete the scope wizard.



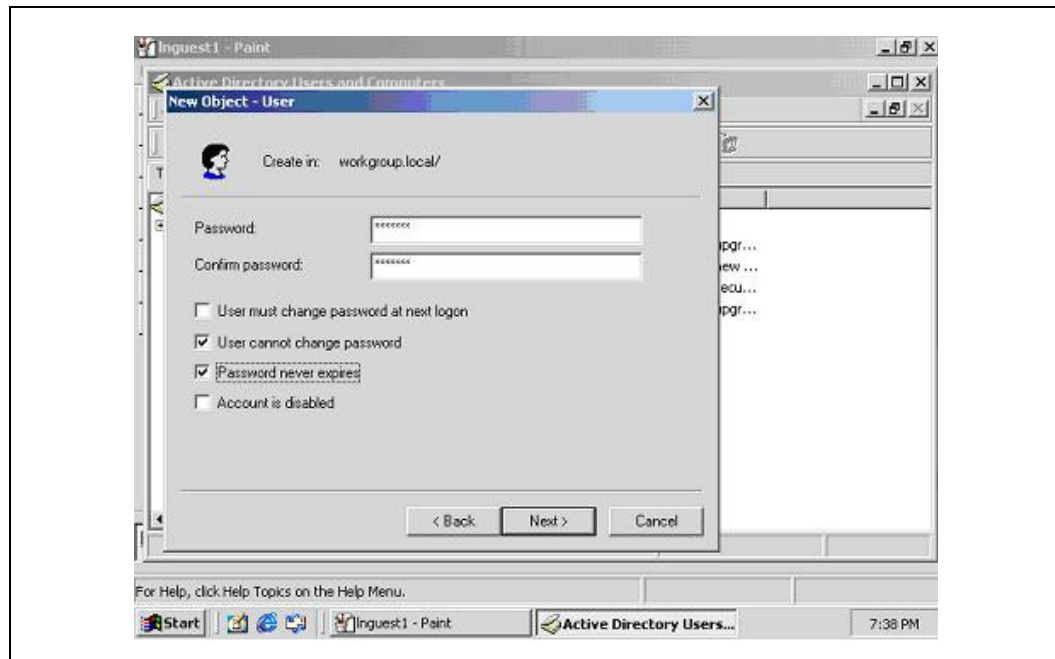
4.2.3 Windows 2000 Server Configuration for LiteNET PC v1.15

After the installations of Windows 2000, appropriate protocols and services and the Intel Electronic Classroom Remote Boot Utility, the following configurations must be completed before the LiteNET PC installation at the student computing stations:

1. Create user accounts.
 - a. Create a domain user account with administrator rights LNGUEST and password LNGUEST (Start>Program>Administrative Tools>Active Directory Users and Computers>Action>New>User).



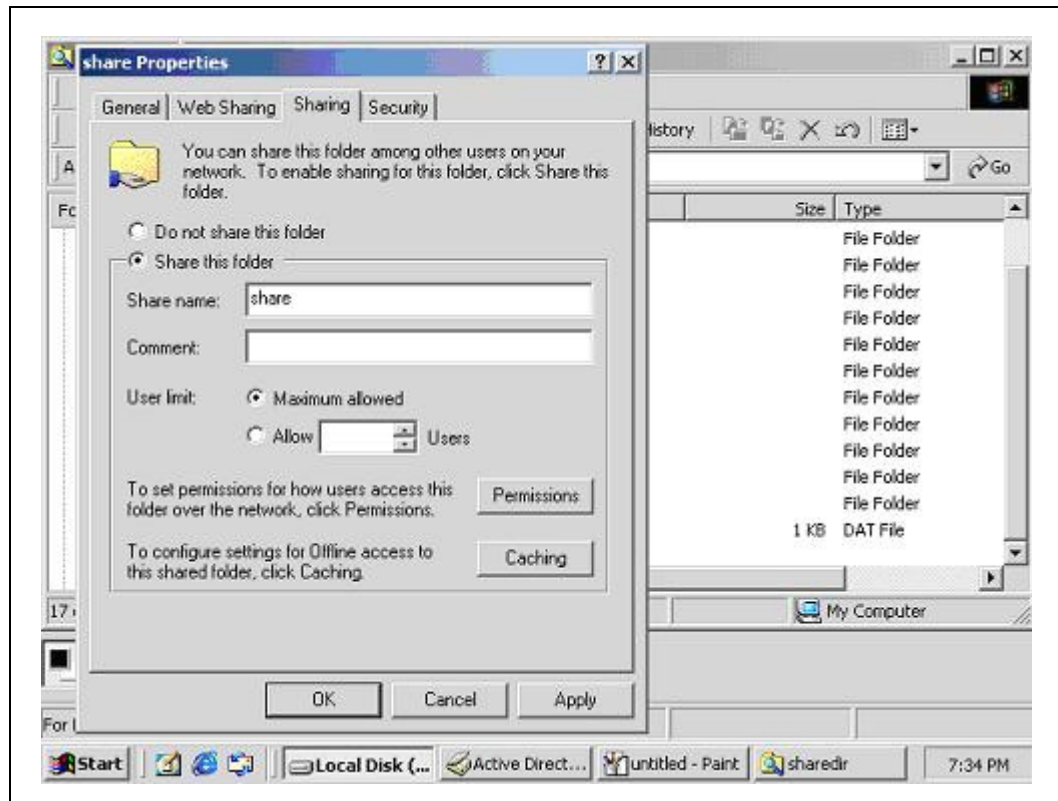
- b. Select **Password never expires** and **User cannot change password**.



- c. Create a domain user account with administrator rights for the user account used for set up. The password must be the same as the user ID.
- d. Select **Password never expires** and **User cannot change password**.
- e. Create a domain user account for each user in the electronic classroom domain. The password must be the same as the user ID.
- f. Select **Password never expires** and **User cannot change password**.

Note: All student station IDs must not have administrator rights.

2. Create a share directory.
 - a. Content Root Directory
 - Create a directory at the server to store all the hard disk content at the setup station, i.e., D:\share.
 - Share the directory to the network (Right click directory>Sharing>Share this folder>Apply).



- b. Individual Student Folders
 - Create a directory to store the student profiles directory at the third partition, i.e., E:\User.
 - Create a directory for each student within the user directory. The folder name must not exceed eight characters, i.e., E:\User\Stu1.
 - Share the directory to the network. This must be done for the proper functionality of remote boot. Share access rights as follows:
 - Full Control to Administrator.
 - Full Control to the owner of the folder (i.e., Stu1).
 - Remove other access rights.
 - Repeat steps for all student folders (i.e., Stu1 – Stu 50).

4.3 **Installing The Intel Electronic Classroom Remote Boot (ECRB) Utility Ver2.0**

This section applies to both Windows NT 4.0 and Windows 2000 Servers and is designed to help you install the utility in the server. The Intel ECRB utility provides the proxyDHCP server and the boot server for remote boot purposes.

4.3.1 **Installing Intel ECRB Utility Ver2.0**

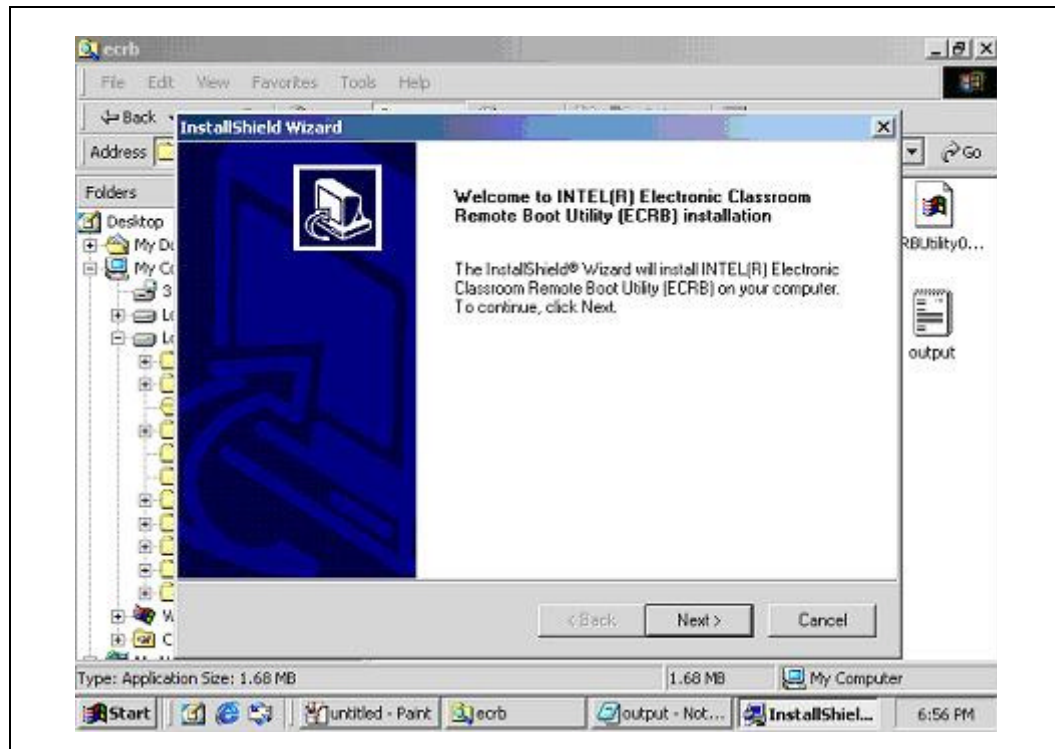
To ensure the remote boot works, the Intel ECRB Utility Ver2.0 must be installed at the server. System integrators must have the following for the Intel ECRB Utility ver2.0 to function properly:

- Intel ECRB Utility Ver2.0 (ECRBUtility082_20.exe)
- 24-byte security keycode (i.e., 1234567890ABCDEF12345678)

System integrators may obtain the Intel ECRB Utility ver2.0 software and a security code to unlock the software from an authorized distributor.

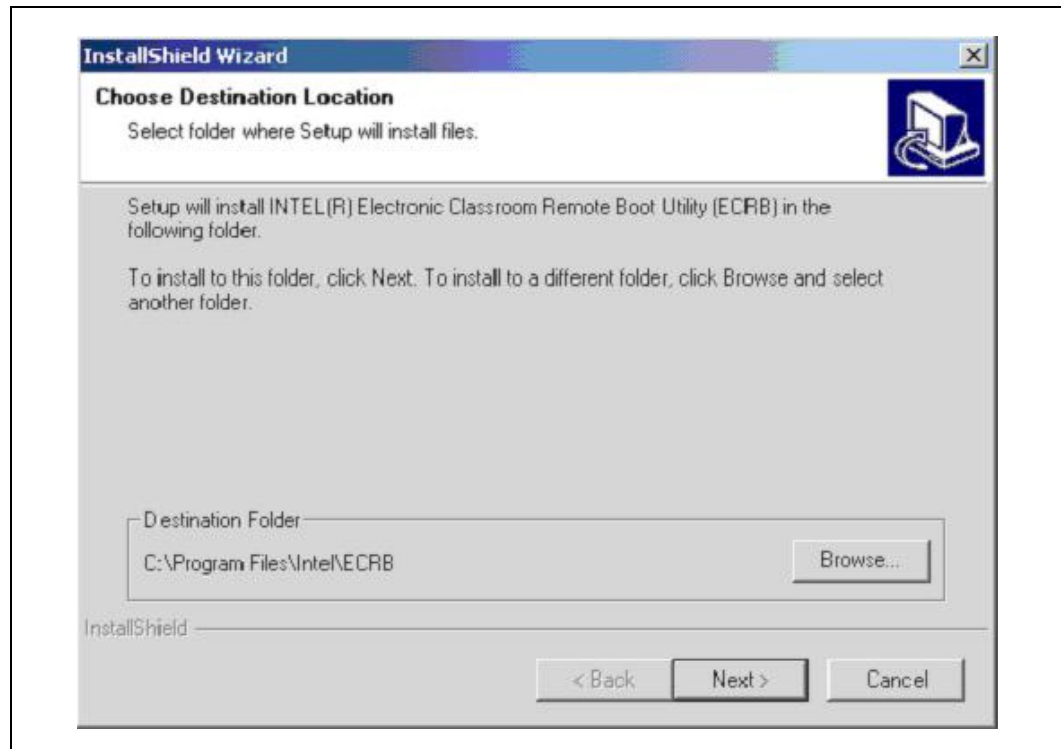
The following are the steps to install the Intel ECRB Utility:

1. Run **ECRBUtility082_20.EXE** at the server.

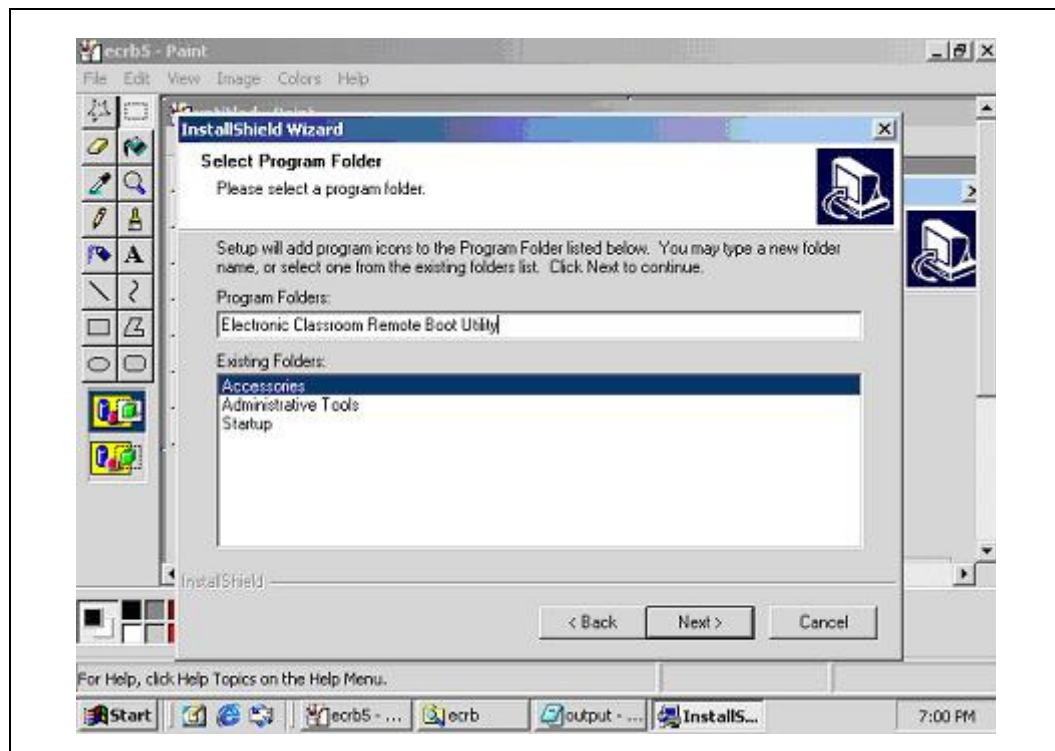


2. When prompted, enter the 24-byte keycode.
3. At the drop-down menu, select the **School Location** for the school to be deployed and **Motherboard Manufacturer** of the motherboard used.

4. Click **Browse** to locate and then select the default installation path **C:\Program Files\Intel\ECRB**. You may specify another installation path if needed.



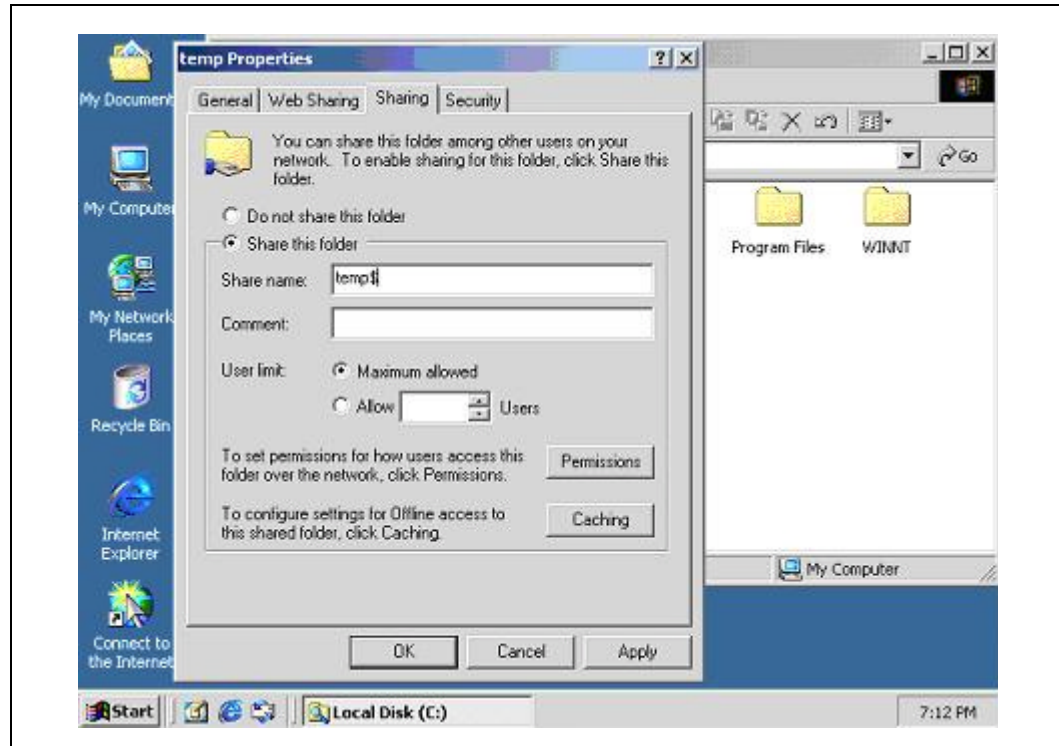
5. The default folder name is *Electronic Classroom Remote Boot Utility*. You may change the folder name if needed.



6. Select **Next** to start installing the utility.
7. Press **OK** when the message *Installation completed successfully* appears. Reboot the system when prompted.
8. After reboot, check to ensure ECRB Services and Intel PXEMTFTP Services are running (Control Panel>Services).

9. Share out the “C:\TEMP” directory at server as “TEMP\$”. Share level access as follows:
 - a. Administrator: Full control
 - b. Everyone else: Read only

Note: This step must be done or the remote boot will not work.



10. Reboot the system to start the ECRB service.
 - a. At the Windows NT 4.0 Server:
 - Change the **PXEMTFTP Service** to **Manual Start** from **Start Automatically** (Control Panel > Services).
 - Click on **Start** to begin the Intel PXEMTFTP Service.
 - b. At the Windows 2000 Server:
 - Change the **PXEMTFTP Service** to **Manual Start** from **Start Automatically** (Start>Program>Administrative Tool>Services).
 - Click on **Start** to start the Intel PXEMTFTP Service.

Note: This is only done during the set up. The service will automatically start in future system reboots.

4.4 Define and Assign Option 60

This section describes how to define option 60 at the server in order for the server to recognize PXE clients. Remote boot will not work without defining and assigning option 60 at the DHCP scope.

4.4.1 Windows NT 4.0 Server Configuration

4.4.1.1 Define Option 60

In Windows NT 4.0, option 60 must be manually defined.

1. At **DHCP Manager**, highlight the scope that was previously created.
2. Go to **DHCP Options>Defaults**.
3. Select New to **Add Option Type**.
4. Enter the following data to define option 60 and click **OK**:
Name: **ClassID**
Data Type: **String**
Array: **Not checked**
Identifier: **060**
Comment: **PXEClient**
5. Select **060 ClassID** from the **Option Name** drop-down menu and enter the string **PXEClient** at the **Value** column.

Note: No space is allowed in PXEClient. The option 60 is now defined and ready to be added to the scope.

4.4.1.2 Add Option 60 to a Scope

After option 60 is defined, the option is to be added to a previously created scope.

1. At **DHCP Manager**, highlight the **Scope** that was previously created.
2. Go to **DHCP Options>Global**.
3. Add **060 Class ID** from **Unused Options** to **Active Options**.
4. Option 60 Class ID is now available in the option configuration of the available scope.
5. Make sure the scope is activated.

After the scope is created with option 60 included, the Microsoft DHCP Manager is ready to assign and recognize Electronic Classroom Student Computing Stations in the remote boot environment.

4.4.2 Windows 2000 Server Configuration

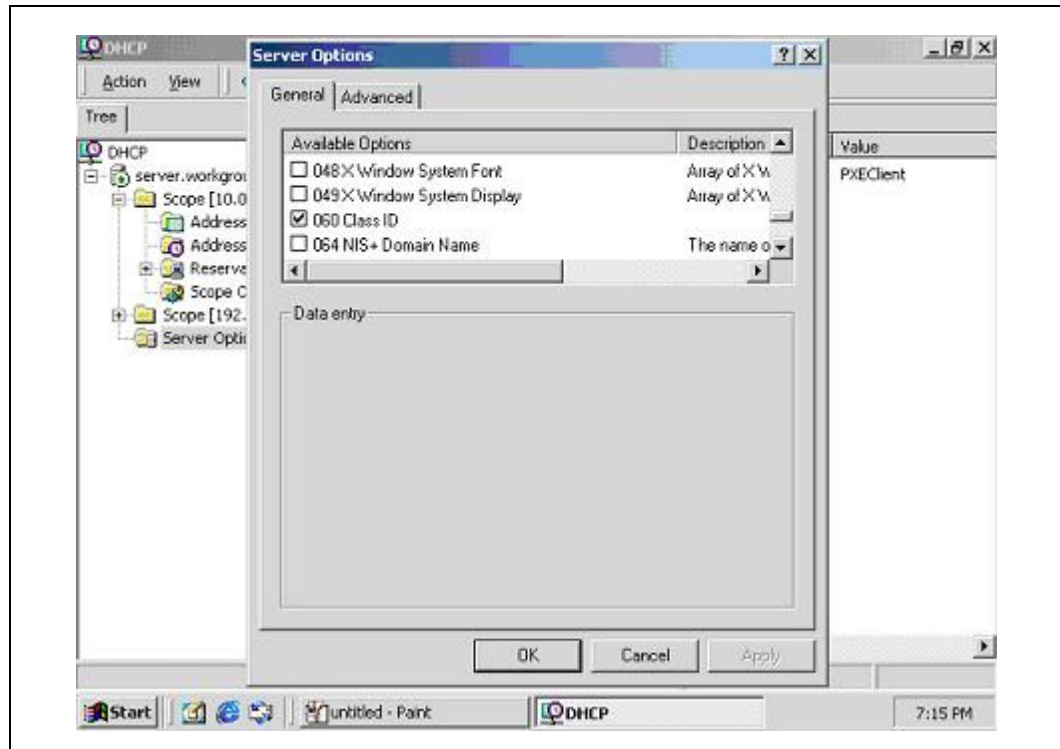
The Intel Electronic Classroom Remote Boot Utility ver2.0 provides a batch utility to automatically define the option 60 in Windows 2000 Server.

4.4.2.1 Define Option 60

1. Go to **Command Prompt** (Start>Programs>Accessories>Command Prompt).
2. Go to the directory **C:\Progra~1\Intel\ecrb\system**.
3. Run the batch file **set_opt60.bat** to define option 60.
— To remove the option 60, run the **rem_opt60.bat** from the path stated in step 2.

4.4.2.2 Add Option 60 to a Scope

1. Go to **DHCP** (Start>Programs>Administrative Tools>DHCP).
2. At the DHCP Server (i.e., 192.168.42.1), right click **Server Options** and select **Configure Options**.
3. Under the **General** tab, locate **060 Class ID** and select it. Click **Apply** to add the scope.

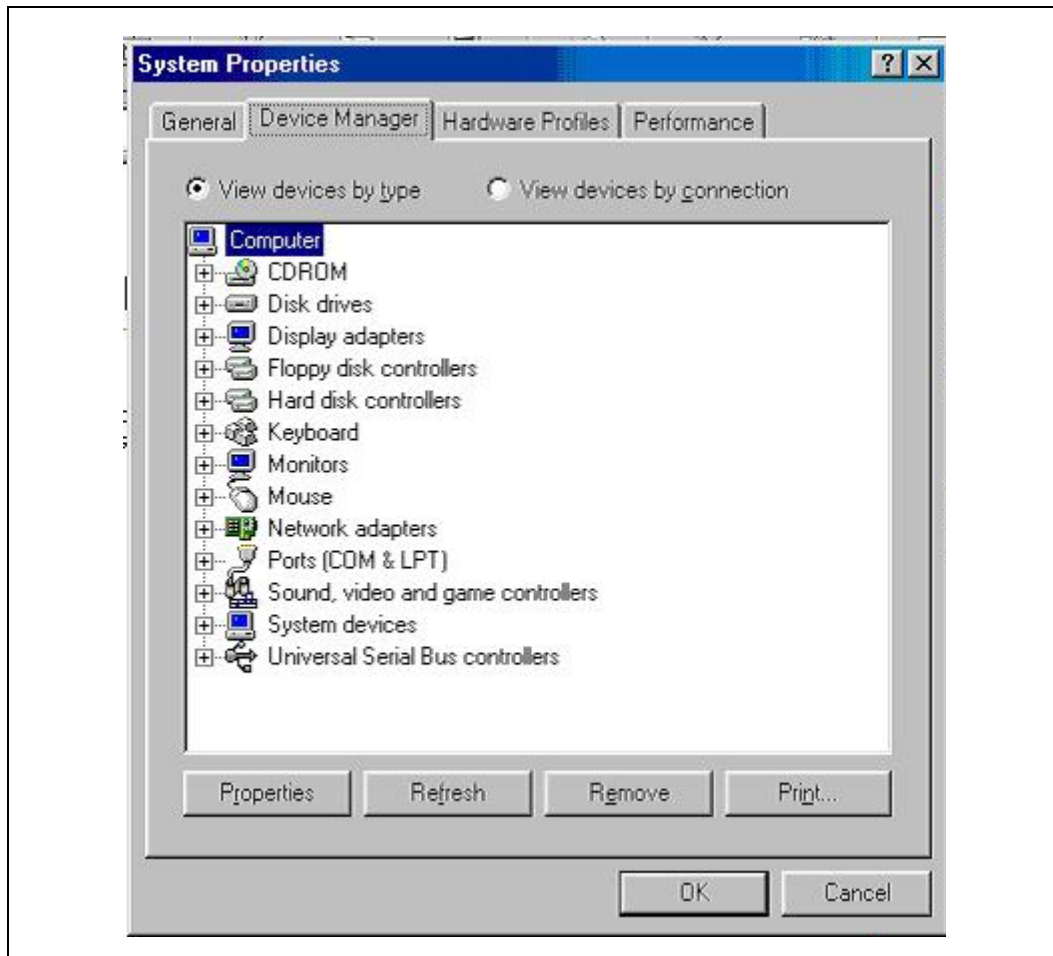


After the scope is created with the option 60 included, the Microsoft DHCP Manager is ready to assign and recognize Electronic Classroom Student Computing Stations in the remote boot environment.

5.0 Remote Boot Installation — Student Computing Stations

5.1 Windows 98 Operating System Installation

1. Select one student computing station as the set-up machine. The student computing station must have a hard disk drive and CDROM installed. Ensure **no** other student computing stations are powered up. Use the logon ID with administrator rights (i.e., Install) for future logon to the server.
2. Install Windows 98 into the set-up station with proper drivers including NIC, audio, video, etc. Under **System Properties**, make sure there is no driver conflict (Control Panel>System>Device Manager). All devices should function properly.



3. Ensure the INF files are installed for Windows to recognize new devices at the motherboard (i.e., Intel® 810 Chipset).
4. Ensure the NIC driver supports real mode and windows mode. Obtain the driver from your motherboard distributor.

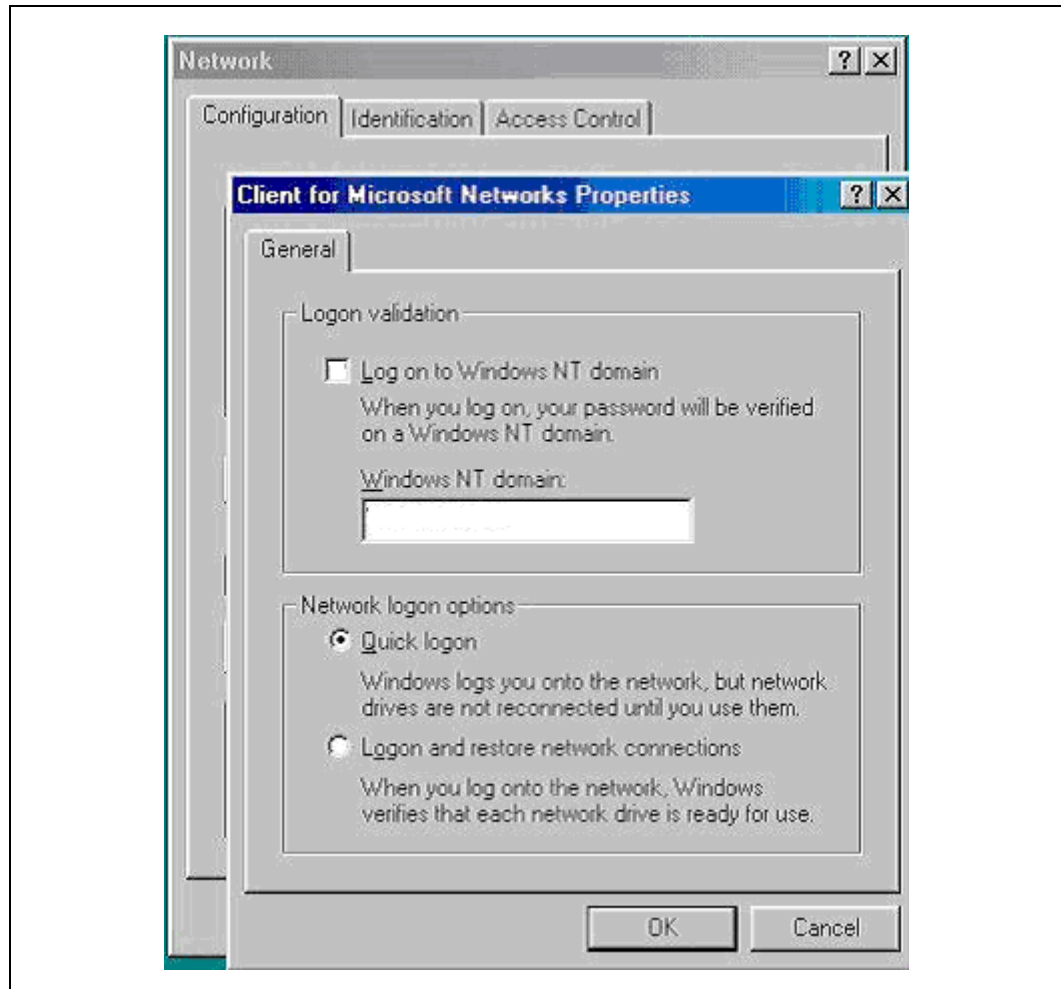
5. At **Network Properties:**

a. Install **Client for Microsoft Networks** (Control Panel> Network>Add>Client).

b. At **Client for Microsoft Networks Properties:**

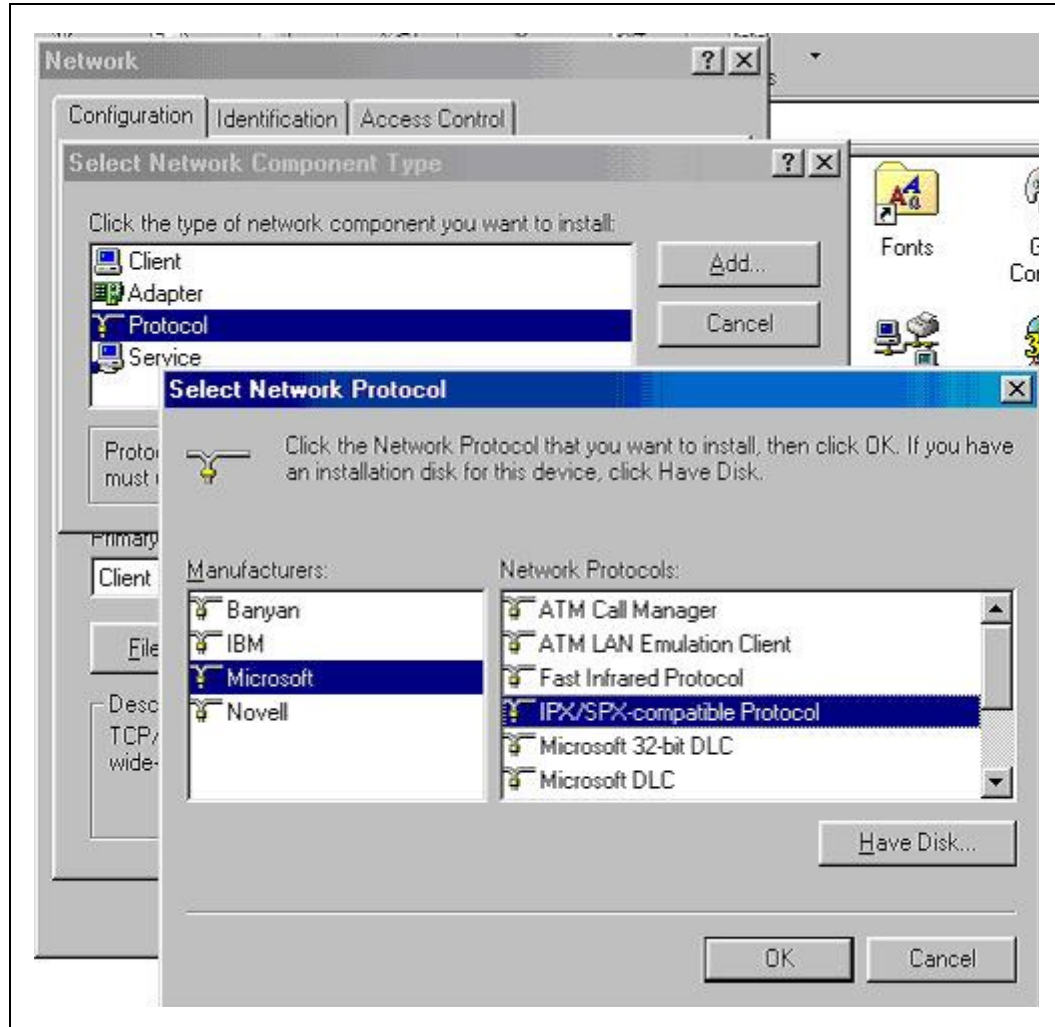
— At **Logon validation**, ensure **Log on to Windows NT domain** is not selected. (This will reduce network traffic in the electronic classroom.)

— At **Network logon options**, select **Quick logon**. Click **OK**.



- c. Install **TCP/IP** and **IPX/SPX Compatible Protocol** (Control Panel>Network>Add>Protocol>Microsoft).

This will install the appropriate network protocols needed by LiteNET PC.



- d. To reduce network traffic, remove all services that are not needed in the electronic classroom, such as Microsoft Family Logon, Dial-up Adapter, and other protocols. This ensures an optimized network environment for the electronic classroom.
- e. At the end of network protocol installation, the network properties should have:
- Client for Microsoft Networks
 - LAN Adapter
 - TCP/IP LAN Adapter
 - IPX/SPX-compatible Protocol LAN Adapter
6. It is recommended that you disable individual user profiles under the remote boot environment. To disable a personal user profile, go to Control Panel>Password>User Profiles.

Ensure **All users of this computer use the same preferences and desktop settings** is selected.

7. Install **TWEAKUI** to enable automatic logon to the NT domain. After the installation, check **Control Panel** to ensure the TWEAKUI icon exists.

Note: TWEAKUI is available in the Windows 98 Installation CD or can be downloaded from <http://www.microsoft.com/NTWorkstation/downloads/PowerToys/Networking/NTTweakUI.asp>. The following files are required for TWEAKUI installation: Tweakui.cnt, Tweakui.cpl, Tweakui.hlp and Tweakui.inf. Install TWEAKUI by right clicking the Tweakui.inf>install.

8. For the Windows 98 Simplified Chinese Version, the file **c:\windows\Net.exe** needs to be replaced for proper operation of remote boot. Obtain the replacement **Net.exe** file from your distributor. To verify the proper functionality of Net.exe and the IPX protocol installed, you may do the following tests:
 - a. Boot the system to DOS environment (press F8 before Windows starts).
 - b. Type the following commands to test the network:


```
c:\> Net start IPX
c:\> Net start workstation
```

 The IPX service should start without any error messages.
 —Real mode NIC driver must be installed, or an error will occur.

Note: The Net view command can not be used to view the computers on the network. NetBEUI is not recommended in the electronic classroom network.

9. All required applications have to be installed before the LiteNET PC installation.

The system is now ready for LiteNET PC installation.

5.2 LiteNET PC Installation

This section describes how to install LiteNET PC Electronic Classroom Edition at the student computing stations. One computing station with administrator rights is needed for the set up with all others powered down (i.e., Logon ID: Install).

5.2.1 LiteNET PC EZ Installer

1. At the server, run the Electronic Classroom Remote Boot Utility (Start>Program Files>Intel ECRB Utility).

Note: LiteNET PC installation will not proceed without the utility running at the server.

2. Run the LiteNET PC Electronic Classroom Edition v1.15 at one student computing station used for set up. You may install LiteNET PC from the server or local hard disk. The following example will show an installation from server path \\server\litenet\.
 - a. Ensure all desktop settings are properly configured.
 - b. Go to Start>Run.
 - c. Browse the location of the LiteNET PC executable setup files.
 i.e., \\server\litenet\setup.exe.

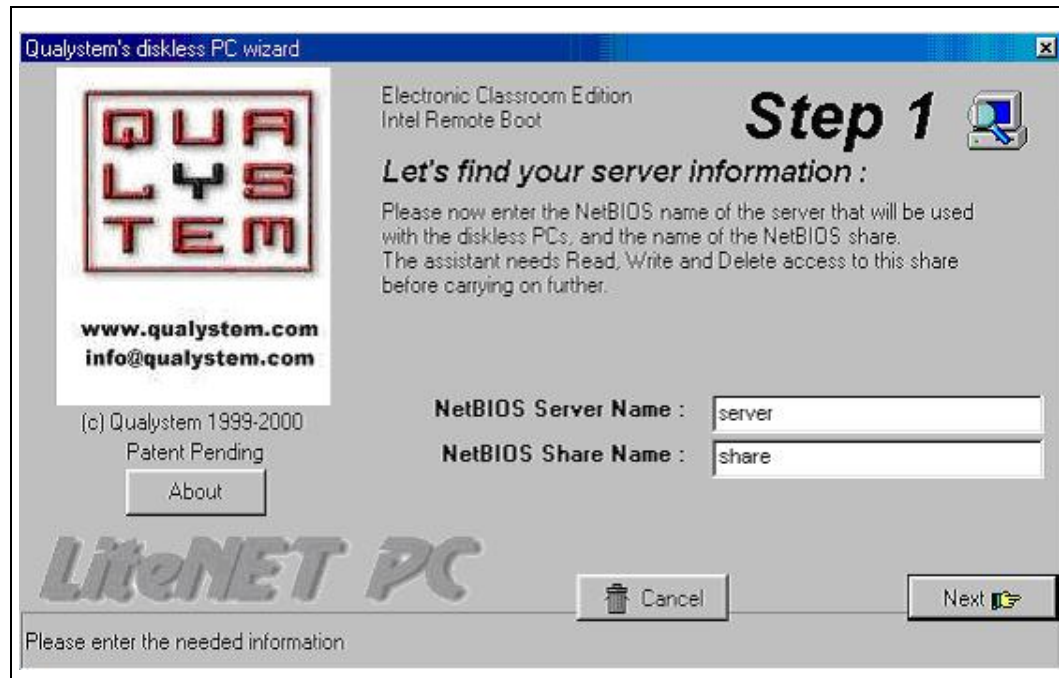
- d. Click **OK** to run LiteNET PC EZ Installer. Follow the instructions from the installer.

Note: All the desktop settings will be taken as default settings for the remote boot stations, including windows that are maximized. If any windows are maximized, minimize them so that the remote boot station will not show the windows when booted up.



3. Read the agreement and click **Yes** to accept and continue with installation.

4. At Step 1, enter the **Server Name** and the **Share Directory Name** that was created at the server (i.e., **Server Name: Server**; **Share directory: Share**).



5. At Step 2, the NDIS2 (real mode) driver of the student station NIC is needed. LiteNET PC EZ Installer will automatically look for the driver.



- a. Select **Next** to accept the real mode network driver.

- b. If the NDIS2 driver is not found, the installer will launch the Qualystem Realmode Network Driver Installer automatically (instinc.exe).
- c. Choose the NIC type at the student station motherboard and click **Install**. Follow the installation instructions.



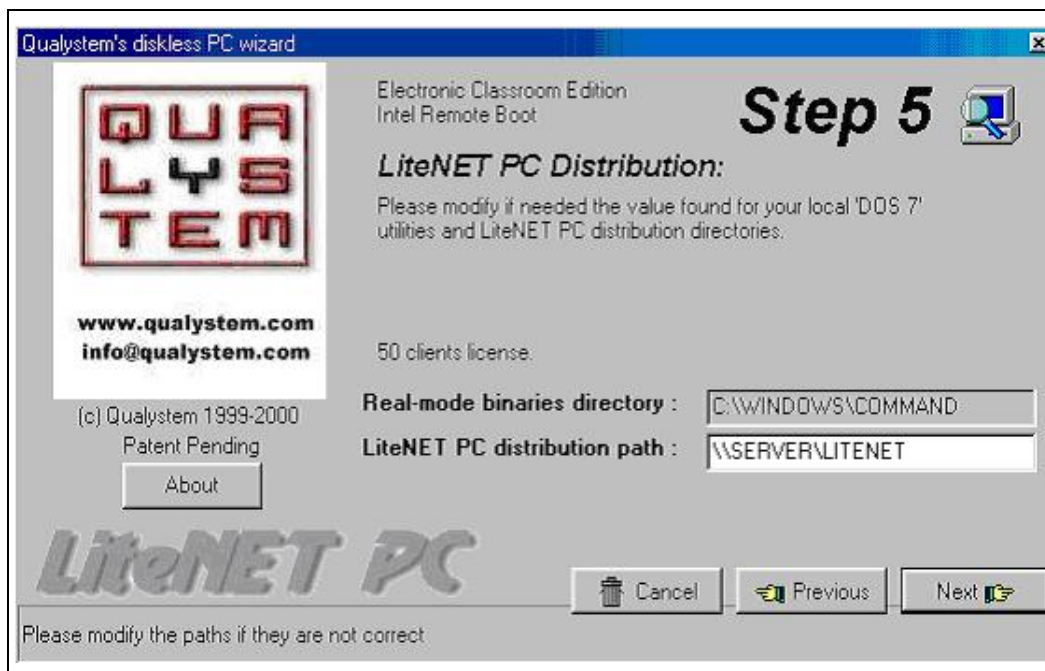
6. After the NDIS2 driver installation, at **Step 3** LiteNET PC EZ installer requires information for the Windows, System and Temp directory. Click **Next** to select the default folder.



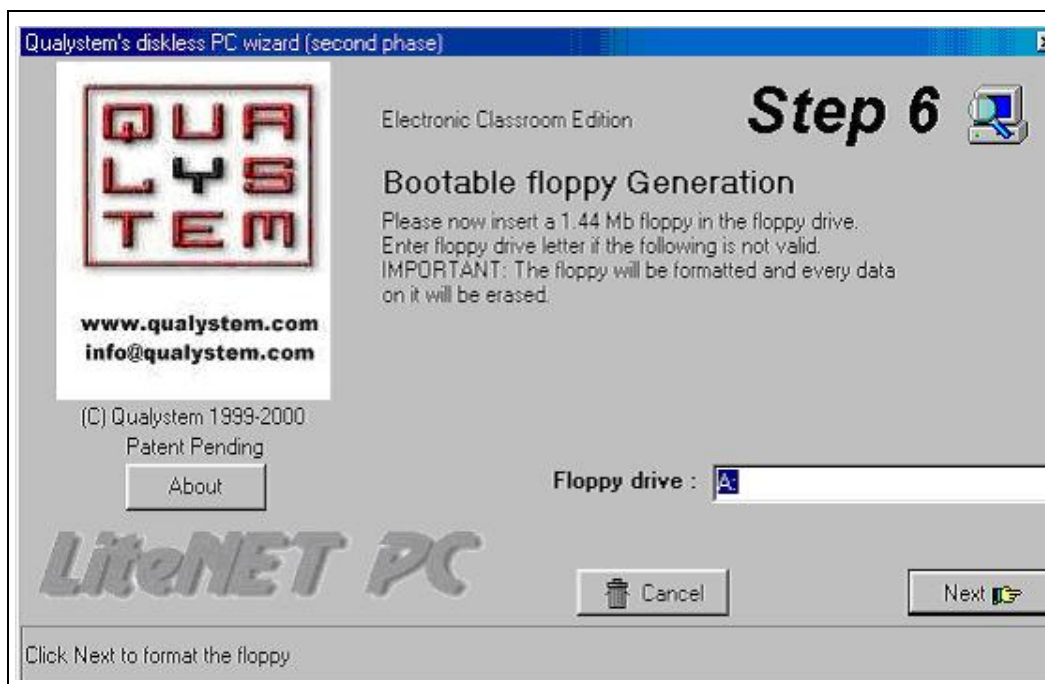
7. At Step 4, LiteNET PC EZ Installer requires to copy some cabinet (.cab) files from the Windows 98 installation CD. Select the location of the Windows 98 installation files and click **Next**.



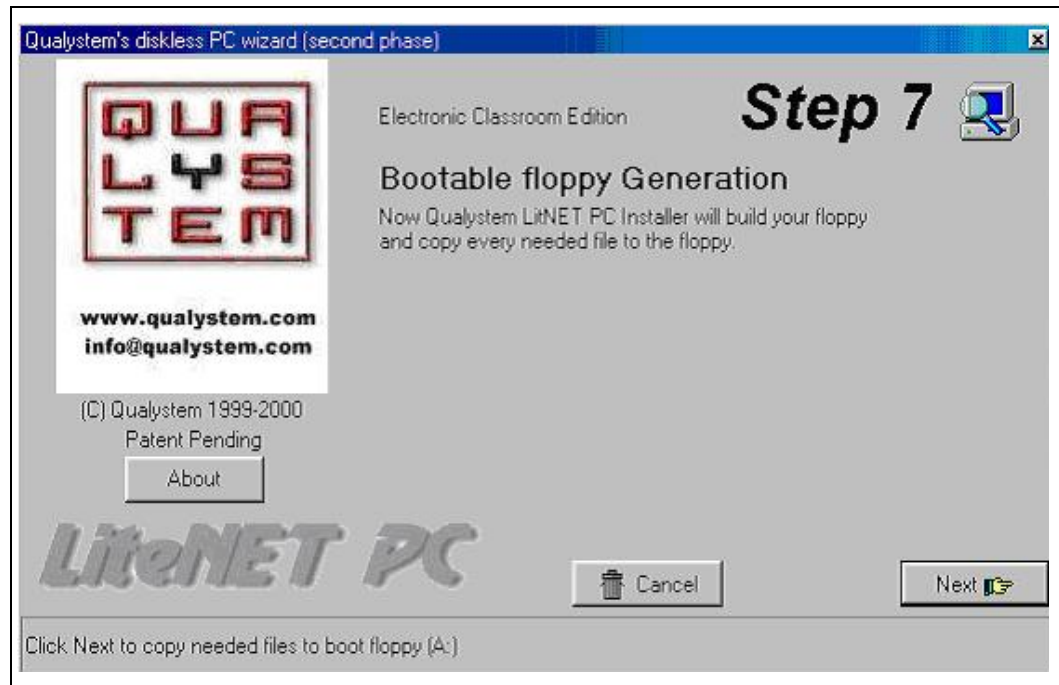
8. At Step 5, the installer will reconfirm the real-mode binary files directory at your hard drive and the LiteNET PC setup file distribution path. Click **Next** to select the default folder and to continue. Reboot the station when prompted.



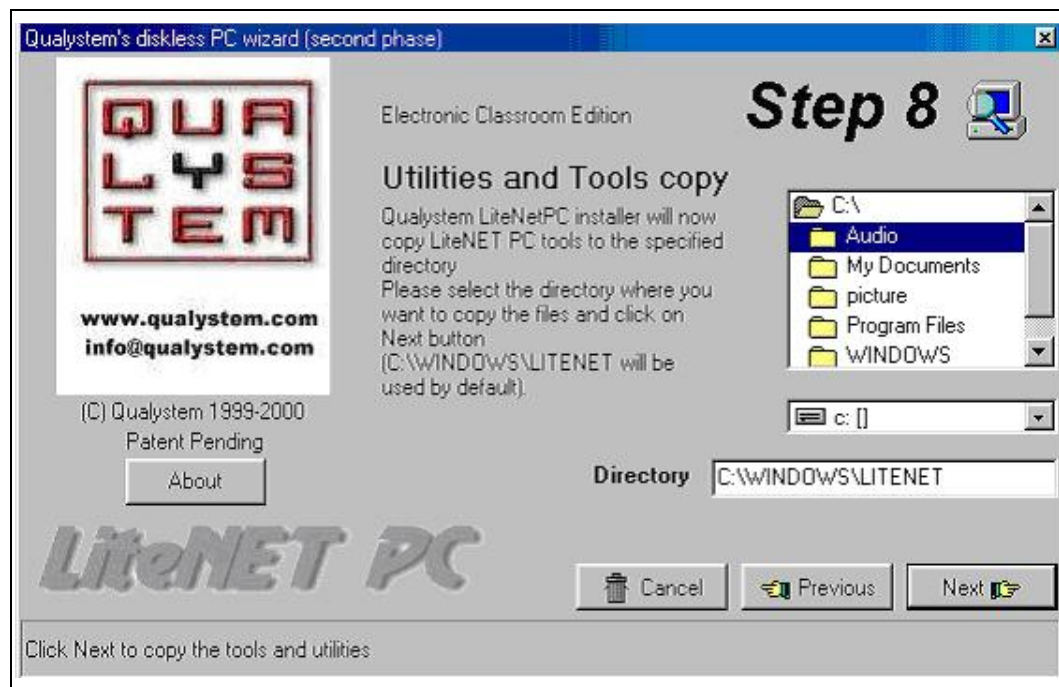
9. A floppy disk is needed at Step 6. The disk will be formatted and used as a bootable floppy disk for the remote boot stations. Insert the disk and click **Next**.



10. At Step 7, the installer will copy the necessary files into the floppy disk to make it bootable for remote boot stations. Select **Next** to continue.



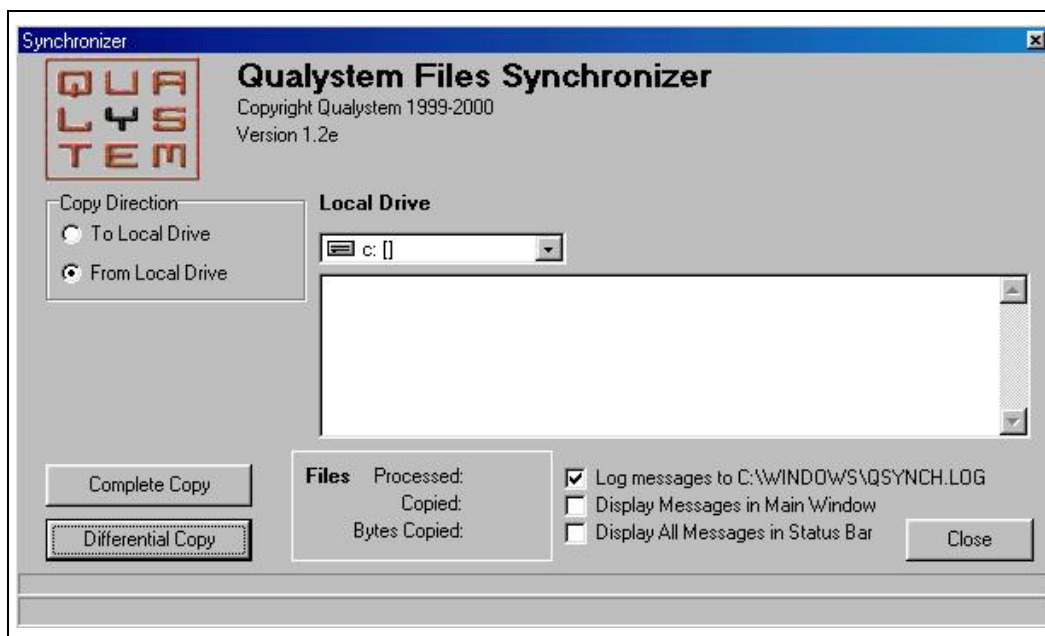
11. At Step 8, the installer will copy LiteNET PC tools to the specified directory. The default directory is C:\WINDOWS\LITENET. Click **Next** to continue.



12. At **Step 9**, the installer will copy all the hard drive content of the set up station to the server shared directory, i.e., `\\server\share`. Select **Next** to launch Qualystem File Synchronizer for copying the files.



13. At the Qualystem Files Synchronizer page, choose **Complete Copy** from the local drive to begin copying files.



14. Upon completion of file copy, if Windows 98 second edition is detected, the installer will launch Ftuner to tune for Windows 98 second edition compatibility.



- a. Insert the bootable floppy created by the LiteNET PC EZ Installer into the floppy drive for tuning. Choose the default settings and proceed with tuning until the process is completed.

15. Toward the end of LiteNET PC installation, LiteNET PC Station Manager will launch. The station manager is used to add more stations in the network (i.e., Stu1 – Stu50). A list of MAC addresses must be obtained for all stations to be included in the network.

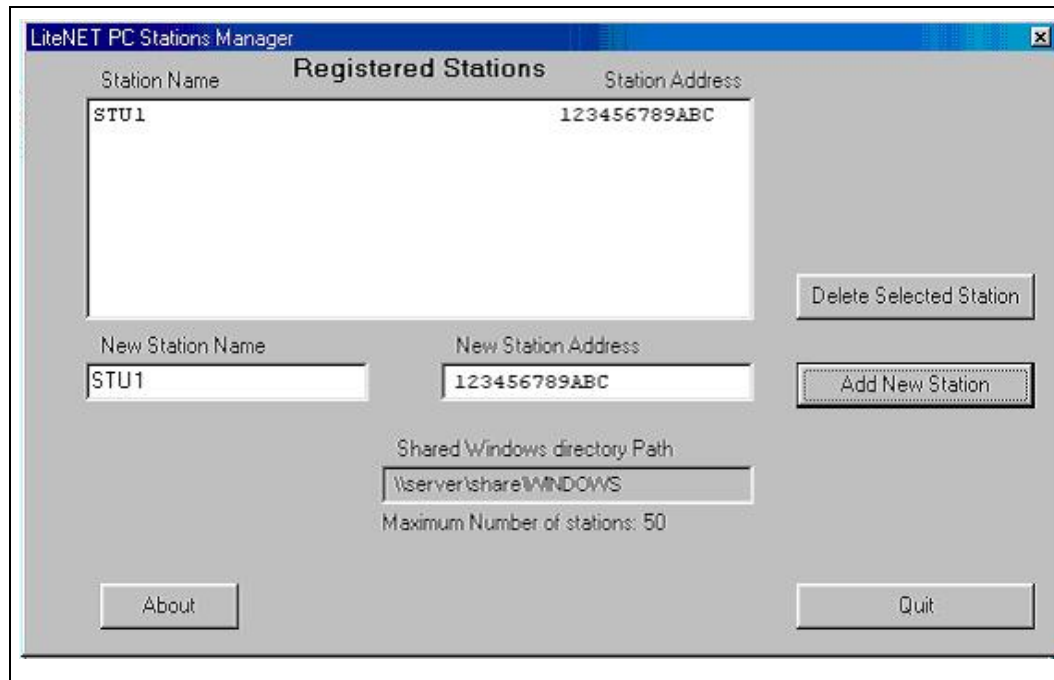
To obtain student station MAC address, run Ipconfig at the DOS environment. You may also note the MAC address at the IP address assigning process during boot up.

- a. Key in the **MAC address** of the student station intended to be connected to the network as remote boot station.

(i.e., New station name: Stu1; New station address: 123456789ABC)

- b. Click **Add New Station** to add the station in to the network.
- c. Repeat steps for other stations (i.e., Stu2 – Stu50).
- d. To add additional stations, launch Station Manager and repeat steps a and b.

Note: The station name must be the same as the user ID and folders created at the server, and must not exceed eight characters.



5.2.2 LiteNET PC Configuration

5.2.2.1 Protecting the Windows Directory

To prevent unauthorized access to the Windows directory and corruption of the system, the Windows directory at the student stations needs to be protected.

1. At the server, go to the shared directory that contains the student station hard drive contents.
(i.e., \\server\share)
2. At the Windows directory within the shared directory (i.e., \\server\share\windows) protect the directory with the following rights:
 - Windows NT 4.0
 - Give the permission of **Full Control** to Administrator.
 - Give the permission of **Read Only** to other domain users.
 - Windows 2000
 - Give the permission of **Full Control** to Administrator.
 - Give the permission of **Read & Execute** and **List Folder Content** for other domain users.

5.2.2.2 Converting Bootable Floppy to Boot Image

To have true remote boot, the bootable floppy needs to be converted to a boot image stored at the server and downloaded to the remote boot student station upon power up.

The Intel Electronic Classroom Remote Boot Utility provides an Image Maker to convert the bootable floppy disk into a boot image. Ensure all necessary configurations or tunings are done at the bootable floppy content before converting it into the boot image.

1. At server, run the **Image Maker** provided by the Intel ECRB Utility.
(Start > Programs > Intel Electronic Classroom Remote Boot Utility > Image Maker)
2. Insert the bootable floppy disk created by LiteNET PC EZ Installer and press **Enter**. The floppy content will be converted to boot image named as ECRB.1 and will be stored automatically at the server.

5.2.2.3 Disable Virtual Memory (Optional)

Windows uses virtual memory when there is not enough memory available at the station. At a 64-Mbyte RAM student station, virtual memory is typically needed. Qualystem LiteNET PC v1.15 Electronic Classroom Edition has virtual memory enabled by default. If more RAM is available (i.e., 128 Mbytes), virtual memory can be disabled to reduce network stress and optimize performance.

To disable virtual memory, the following steps need to be done after the LiteNET PC installation.

1. At server, go to the shared directory that contains the student station hard drive content
(i.e., \\server\share).

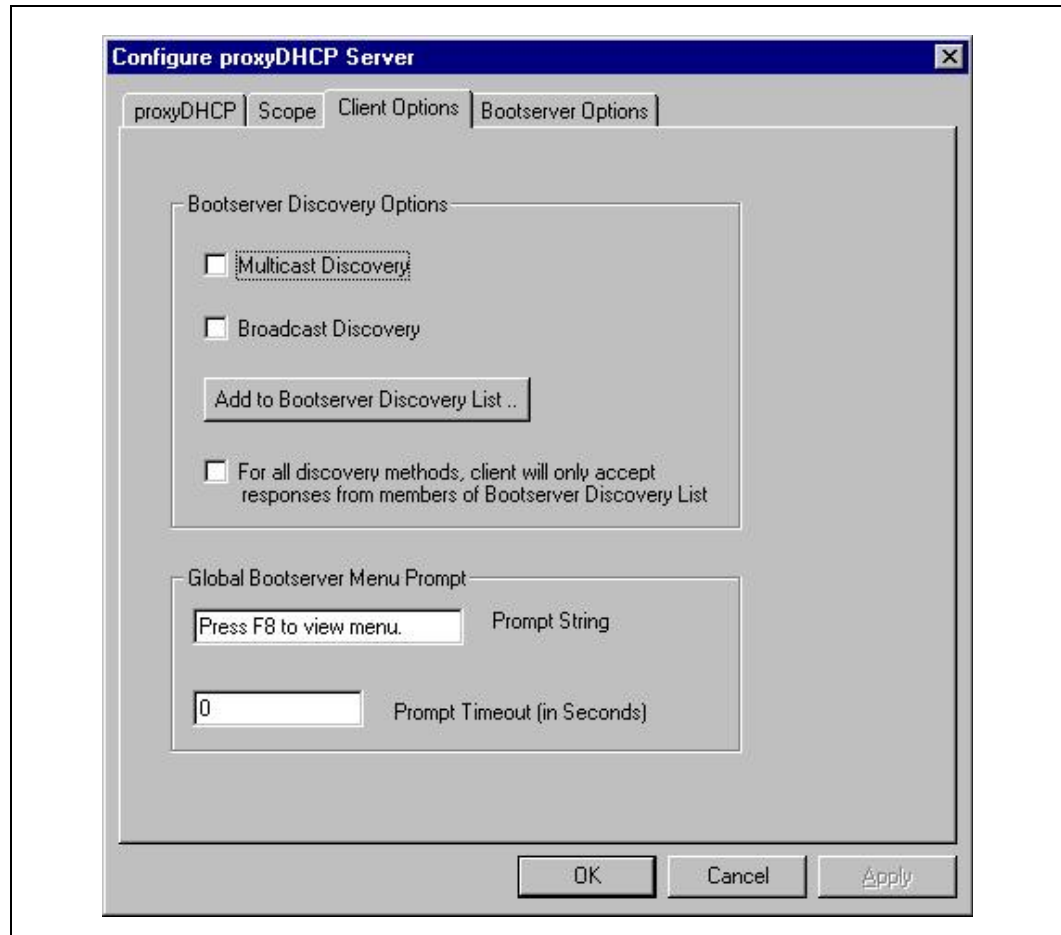
2. At the shared directory, go to the Windows directory (i.e., \\server\share\windows).
 - a. Edit the *system.ini* file that resides in the Windows directory.
Remove the following lines in the [386Enh] section:
PagingDrive=S:
MaxPagingFileSize=65536
 - b. Edit the *usercmd.bat* file that resides in the Windows directory.
Add **REM** in front of the existing line to disable virtual memory settings.
After you make the addition, the line should read:
REM QVMem S: %SERVER% %USERNAME%

5.3 Configuring ProxyDHCP and Boot Server

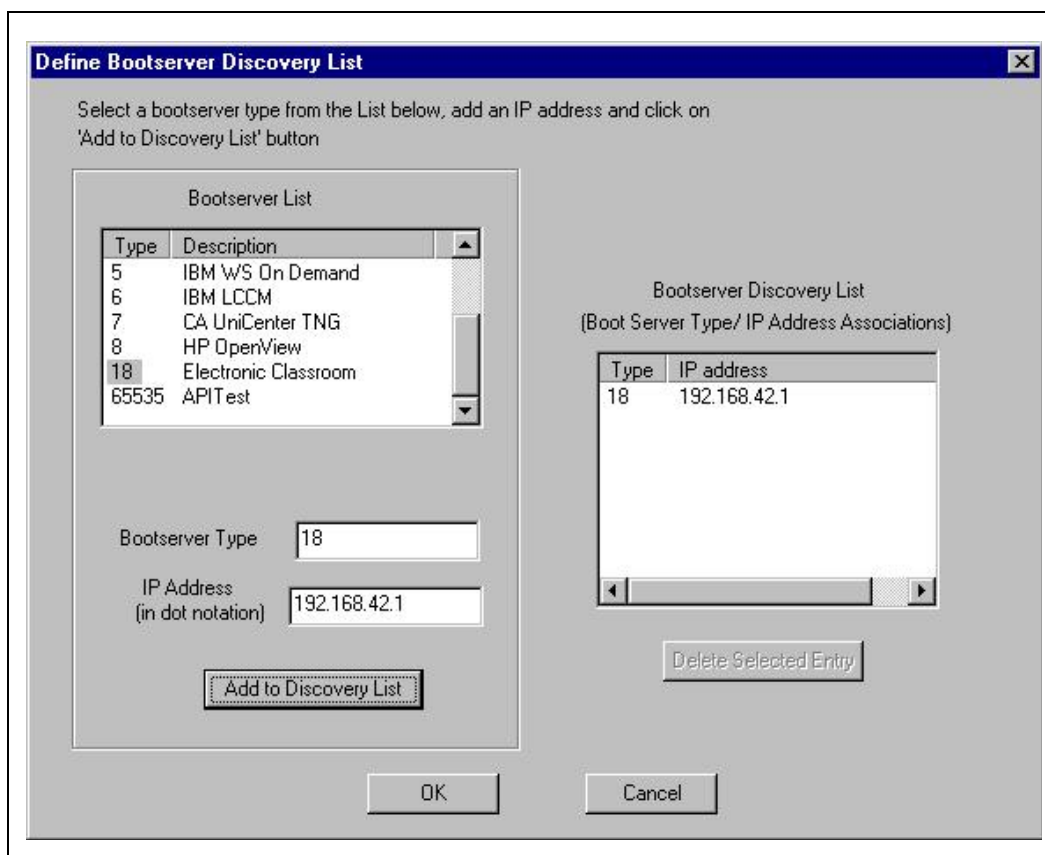
After the installation and configuration of LiteNET PC at the student station, the Intel Electronic Classroom Remote Boot Utility must be configured to download the boot image properly upon request.

5.3.1 Configure ProxyDHCP Server

1. Launch the **Intel ECRB Utility** (Start>Program>Intel Electronic Classroom Remote Boot Utility).
2. Right click the **proxyDHCPserver** and choose **Configure proxyDHCPserver**.
3. Click on **Add to Bootserver Discovery List** and click **OK**.



4. At the **Bootserver List**, select **Type 18: Electronic Classroom**. Double click to add into **Bootserver Type**.
5. Enter the **IP address** for your server (i.e.,192.168.42.1).
6. Click **Add to Discovery List** and click **OK** to complete.



After the proxy DHCP boot server is configured and assigned with an IP address (your server IP) to the boot server, the student station is ready to remote-boot its image from the server.

5.4 Final Steps

5.4.1 Removing the Hard Drive from the Set-up Station

After all configurations are done, the hard drive in the student station used for setup must be removed. Ensure all disk-less student computing stations (with identical motherboards) are connected to the network with the network bootrom enabled. Refer to the user documentation for the motherboard on how to enable the bootROM to boot from LAN.

6.0 Summary

Intel provides the building blocks needed to implement an electronic classroom in a short period of time. The classroom solution meets a wide-range of school requirements, including:

- Ease of use
- High up-time
- Low maintenance
- Manageable costs

The remote boot service promotes the use of Intel-based Electronic Classroom stations by eliminating the need of a hard disk on each station. The advantages of a remote boot solution include:

- Central management of student stations
- Prevention of students accidentally corrupting the operating system and applications
- Ease of updating software
- Low maintenance costs

7.0 Quick Checklist for Remote Boot Setup

7.1 Server

1. Install Windows NT 4.0 or Windows 2000 server.
2. Create three partitions at the hard drive:
 - a. C:\ drive for Windows and Program Files
 - b. D:\ drive for student stations' shared root directory storage
 - c. E:\ drive for student stations' profiles storage
3. Install all the necessary drivers.
4. Install server as domain controller.
5. Install TCP/IP and assign a static IP address to the server.
6. Install IPX/SPX compatible protocol.
7. Install and configure the DHCP server.
 - a. Create a scope for IP address leasing.
8. Install and configure ECRB Utility.
 - a. Change PXEMTFTP service to manually start.
9. Define and assign option 60.
 - a. Add option 60 to the DHCP scope.
10. Share C:\TEMP as TEMP\$.

11. Create LNGUEST user with LNGUEST password and admin rights.
12. Create a user name INSTALL and password INSTALL with admin rights.
13. Create user names for all clients. The password must be the same as the user name created (i.e., user name = STU1, password = STU1).
14. Create a shared folder for storing the student stations' shared root directory (i.e., D:\share).
15. Create a folder user to store all the student profiles directory (i.e., E:\user\stu1). Share each student profile directory (Stu1).
16. Set permissions for student folders.
17. Launch Intel ECRB utility before running LiteNET PC EZ Installer.
18. After LiteNET PC installation, configure the boot server at ECRB Configuration Utility.
 - a. BootServer Type = 18
 - b. IP Address = server's IP address
19. Protect the windows directory at the student stations shared folder (i.e., D:\share\windows).
 - a. Windows NT 4.0
 - Give the permission of **Full Control** to Administrator.
 - Give the permission of **Read Only** to other domain users.
 - b. Windows 2000
 - Give the permission of **Full Control** to Administrator.
 - Give the permission of **Read & Execute** and **List Folder Content** for other domain users.

7.2 Client

1. Install Windows 98.
2. Install all the necessary drivers and applications.
3. Install IPX/SPX protocol.
4. Disable user profile.
5. Install TWEAKUI.
6. Install NDIS2 or real mode NIC driver.
7. Run LiteNET PC Ez Installer (LiteNet PC will install NDIS2 driver if it's not available).
8. Create bootable floppy disk.
9. Run complete synchronization.
10. Run Ftuner.
11. Run station manager, key in all the clients' user name and MAC address.

7.3 Optional Configuration

1. Disable virtual memory
 - Make the following changes to the bootable floppy before running Image Maker at server: At A:\WINBOOT\STARTNET.BAT
Add **REM** in front of the following line:
QVMEM S: %SERVER% %USERNAME%
 - Make the following changes to \\SERVER\SHARED\WINDOWS\SYSTEM.INI
At [386Enh], remove the following lines:
PagingDrive=S:
MaxPagingFileSize=65536

8.0 Related Information and Web Sites

Web Site Description	URL Location
Intel Electronic Classroom	http://developer.intel.com/platforms/applied/studentstation/index.htm
Intel Main	http://www.intel.com/
Intel Developer	http://developer.intel.com/
Intel EIA	http://developer.intel.com/design/intarch/
Intel Wired for Management	http://developer.intel.com/ial/wfm/index.htm
Network Product	http://www.intel.com/network/
Server Product	http://developer.intel.com/design/servers/
Qualystem	http://www.qualystem.com

9.0 Frequently Asked Questions

9.1 Remote Boot Installation

1. I'm installing and configuring my server, but I found that my network adapter on the server is not activated. I'm sure I used the right driver in this case.

Answer: Check to see if you have installed all the protocols needed at the server. The following protocols must exist at the server:

- a. NWLink IPX/SPX Compatible Transport
- b. NWLink NetBIOS
- c. TCP/IP Protocol

2. When I install and run the LiteNET PC, I follow every step by keying in the server name and share directory name, but I still get the message that ecrb.exe cannot be detected.

Answer: You need to get the first computing station to log in the server with administrator rights at User Manager for Domain. But, remember to REMOTE THE ADMIN RIGHT after the whole installation process.

3. At Step 1 in the Qualystem EZ Installer wizard, NetBIOS Server Name and NetBIOS Share Name were prompted. When the correct server name and the share directory name are provided, the following error message appears:

Server was not reachable. Please enter valid information.

Answer: You may have forgotten to share out the *share* directory at the server. To share a directory, right click on the **share** directory, and select **Sharing** option. A Share Properties interface will appear, and you need to select the option **Share this folder**, click on **Apply**, and **OK**.

4. At Step 1 in the Qualystem EZ Installer wizard, NetBIOS Server Name and NetBIOS Share Name were prompted. When the correct server name and the share directory name were provided, the following error message appears:

***Couldn't find ECRB Service at default location
(\\server\C\$\ProgramFiles\Intel\ECRB\System\ECRBService.exe) on server.
Please enter the path where ECRBService is located on the server
(\\server\D\$\ECRB\ECRBService.exe for instance).
Use administrative shares (C\$, D\$ etc) if needed***

Answer: The student station used for setup must be logged in to the network with administrator access rights. Add the student station in administrators group at the server, log off the student station, log in again and run the LiteNET PC setup. Remember to remove the administrator rights from this user after finishing the system installation phase.

5. At Step 1 in the Qualystem EZ Installer wizard, NetBIOS Server Name and NetBIOS Share Name were prompted. When the correct server name and the share directory name were provided, the following error message appears:

***The server didn't answer. Please be sure that ECRB.EXE is running on the server side.
Setup Aborted!***

Answer: You forgot to activate the Intel Electronic Classroom Remote Boot Utility – ECRB Configuration Tool at the server. Run it at the server before LiteNET PC installation (Go to *Start > Programs > INTEL Electronic Classroom Remote Boot Utility*).

6. At Step 1 in the Qualystem EZ Installer wizard, NetBIOS Server Name and NetBIOS Share Name were prompted. When the correct server name and the share directory name were provided, the following error message appears:

Intel Eletronic Classroom Remote Boot Server seems not to be properly installed (4)

Answer: You forgot to share out the temp directory at the server. To share the temp directory, right click at **C:\temp** and select **Sharing**. Select the option **Share this folder**. Take note that the temp directory should always be shared as **temp\$**. Now you may proceed with the LiteNET PC installation.

7. When I'm about to run the LiteNET PC setup, the following error messages appears:

Intel Electronic Classroom Remote Boot Server seems not to be properly installed (2)

List index out of bounds(3)

Answer: These error messages indicate you are not using the correct files to install the electronic classroom network. Please make sure you use the correct pair of installation files: Intel ECRB Utility ver 2.0 and LiteNET PC v1.15.

9.2 Windows 98 Boot Up at Student Computing Stations

1. When the diskless student computing stations boot up, the following message appears:

PXE-E77: Bad or missing discovery server list

PXE-M0F: Exiting PXE ROM.

DISK BOOT FAILURE, INSERT SYSTEM DISK AND PRESS ENTER

Answer: You forgot to configure the proxyDHCP server at the server side. The proxyDHCP server provides the boot server discovery list per student computing station request in the remote boot. The proxyDHCP server can be configured from the Electronic Classroom Remote Boot Utility at the server (Go to Start>Programs>INTEL Electronic Classroom Remote Boot Utility > Electronic Classroom Remote Boot Utility).

At the ECRB Configuration Tool window, right click at icon proxyDHCP server and select *Configure proxyDHCP Server* to bring up the configuration window interface.

Follow the steps below to configure your proxyDHCP server.

- a. Select the option tab **Client Options**.
- b. Click on **Add to Bootserver Discovery List**.
- c. From the Bootserver List menu, select the Electronic Classroom, which is available with boot server type 18.
- d. In the **IP Address** text field, provide the static server IP address which you already define in the previously DHCP server configuration steps.
- e. Click on **Add to Discovery List**.
- f. Click **OK** to complete the proxyDHCP server configuration.

The server IP address that you type in will be available in the Bootserver Discovery List with boot server type of 18.

Note: Make sure that you enable the Boot ROM at the BIOS.

2. When the diskless student computing stations boot up, the following message appears:

Auto-select:

Electronic Classroom Boot Server

PXE-E78: Could not locate boot server

PXE-M0F: Exiting PXE ROM.

Answer: The system cannot find the boot server IP address. You need to provide the correct boot server IP address at the server. Follow the steps below to provide the boot server IP address.

- a. Go to Start>Programs>INTEL Electronic Classroom Remote Boot Utility> Electronic Classroom Remote Boot Utility.
- b. Right click on **proxyDHCP server**, and select **configure proxyDHCP server**.
- c. Select the option tab **Client Options**.
- d. Click on **Add to Bootserver Discovery List**.
- e. From the Bootserver List menu, select the **Electronic Classroom**, which is available with boot server type 18.
- f. In the **IP Address** text field, provide the static server IP address that you defined in the previous DHCP server configuration steps. This IP address will also be your boot server IP address.
- g. Click on **Add to Discovery List**.
- h. Click **OK** to complete the proxyDHCP server configuration.

3. When the diskless student computing stations boot up, the following message appears:

Requesting more DHCP options...

Downloading DOS boot diskette image...

PXE-E89: Could not download boot image.

PXE-M0F: Exiting PXE ROM.

DISK BOOT FAILURE, INER SYSTEM DISK AND PRESS ENTER

Answer: There is no electronic classroom boot image found in your boot server. You need to create the boot image (*ecrb.1*) from the bootable diskette (the floppy disk you generated through the LiteNET PC process). Follow the steps below to create the boot image to the boot server.

- a. Insert the bootable diskette into the server floppy disk drive.
 - b. Go to Start>Programs>INTEL Electronic Classroom Remote Boot Utility>Image Maker.
 - c. Follow the instruction on the screen to create the boot image.
4. When I boot up the student computing station in the DOS environment, the system prompts me for the password. The following message appears:

... ..

Connecting C: to \\server\share

The password is invalid for \\server\share. For more information, contact your network administrator.

Type the password for \\server\share

Answer: You forgot to create the default user LNGUEST account at the server.

Go to Start > Programs > Administrative Tools (Common) > User Manager for Domains.

Click on **User**, and then click on **New User**. Click a new account for the user named LNGUEST with password LNGUEST. Configure the new account as follows:

- a. Uncheck the **User Must Change Password at Next Logon**.
 - b. Select **User Cannot Change Password** and **Password Never Expires**.
 - c. Ensure LNGUEST has administrator rights.
5. During remote boot, the student computing station displays the following error message:
Error 67: The specified shared directory cannot be found. Make sure you have specified the network name correctly. If the problem persists, contact your network administrator.

Answer: You forgot to create the user folder at the server, or the user folder is not being shared out. Please make sure you create the user folder at the server, and share out this user folder with full access permission rights to administrator and that particular user only.

6. During remote boot, the student computing station displays the following error message:
PXE-E32: TFTP open timeout
PXE-E32: TFTP open timeout
PXE-E32: TFTP open timeout
PXE-E32: Exiting PXE ROM
DISK BOOT FAILURE, INSERT SYSTEM DISK AND PRESS ENTER

Answer: The MTFTP service is not activated. Go to the server and activate the MTFTP service from the **services**. Ensure the MTFTP Service is configured as **Manual Start** but not **Automatic Start**. ECRB Service should be configured as **Automatic Start**.

7. During remote boot, the student computing station displays the following error message:
Security error (Code 02)
Security check failed

Answer: This security error is due to the improper installation of ECRB and LiteNET PC. You may have missed some critical part in the installation phase. In this case, you need to reinstall the Intel ECRB Utility ver2.0 at the server and run the LiteNET PC version v1.15 set up again. The complete installation can be found in the Electronic Classroom Implementation Guide. The following steps explain how to run the LiteNET PC setup.

- a. Make sure you uninstall the old ECRB components from the server. You can always go to the server, at Control Panel>Add/Remove Program to remove all the ECRB Components.
- b. Make sure you delete the C:\temp folder from the server.
- c. Create the share folder and user folder at the server, and share them out as normal.
- d. Reboot the server, and install the ECRB utility at the server.
- e. Notice that the temp folder is created again in the C:\ drive. Make sure you share out the temp right now as **temp\$**. This step should be done before you run the LiteNET PC setup.
- f. Activate the Electronic Classroom Remote Boot Utility at the server, and run the LiteNET PC set up at the student station.

Refer to the original implementation guide for installation details.

8. During remote boot, the student computing station displays the following error message:
No boot disk found.

Answer: Your Boot ROM has not been enabled. You need to enable your Boot ROM to support remote boot. You can always obtain the Boot ROM utility from your electronic classroom distributor. Run the file to enable the Boot ROM and reboot the system.

9. Whenever I try to remote boot the student station, the system hangs with following message:

Unsupported hardware!

Answer: Please contact your motherboard distributor. The motherboard you are using does not support Intel ECRB Utility ver 2.0/LiteNET PC v1.15. Please choose the correct motherboard from your distributor.

10. When I boot up the student computing station, the following error message appears:

Error 55: The specified resource is not available. The computer that shared the resource might have been turned off, or the permissions might have been changed. For more information, contact your network administrator.

Answer: There is wrong configuration at LNGUEST at the server. The default user LNGUEST with password LNGUEST should not expire and never allow the user to change the password.

Go to Start > Programs > Administrative Tools (Common) > User Manager for Domains.

Double click on **LNGUEST**.

- a. Uncheck the **User Must Change Password at Next Logon**.
- b. Check the **User Cannot Change Password**.
- c. Check the **Password Never Expires**.

11. When I boot up the student computing station everything sounds good, but the system hangs and the following error message appears:

***While initializing device SHELL:
Cannot find or load required file KRNL386.EXE.***

Answer: Make sure you are using the same motherboard type for all student computing stations. Then, check the following to ensure they are the same on each station:

- a. BIOS settings
 - b. Motherboard type and revision
- If everything is correct, the boot image may have corrupted. Set up LiteNET PC again.